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B. C. HYDRO AND POWER AUTHORITY

VANCOUVER ISLAND GAS PIPELINE
FINAL ROUTE ANALYSIS

APRIL 1963

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SUMMARY

BACKGROUND

B. C. Hydro proposes to apply for an Energy Project Certificate to construct and operate a pipeline system that will transport and distribute natural gas to residential, commercial, and industrial customers in a Vancouver Island market area extending from Victoria to Campbell River, including the Port Alberni area, and on the mainland to Powell River, as appropriate.

The project will meet provincial and federal energy and economic policy objectives. Technical and environmental feasibility has been established.

While designing a technically acceptable pipeline system to serve the markets, B. C. Hydro has sought a pipeline route that would have a low impact on the physical, biological, and social environments.

This report describes the preferred route that B. C. Hydro proposes and presents the analysis leading to the selection of that preferred route.

Detailed design of the proposed system is not yet complete. B. C. Hydro will complete the design following amendments, if any, to its proposed routing to accommodate reasonable or necessary changes that may arise following further studies or review of the project by government and the public.

ROUTE STUDIES

As part of the comprehensive planning for the project, B. C. Hydro used the Province's Guidelines for Linear Development as a framework to study and locate the pipeline routing that offers the optimum opportunity to meet the needs of the environment and those of the engineering work.

A team of environmental, land use, and engineering specialists indentified a number of possible routes from the Lower Mainland to and on Vancouver Island. Then they narrowed it down to the one that best met these five criteria:

- minimal environmental and social impact;
- minimal construction difficulty;
- availability of suitable rights-of-way;
- acceptable construction and operation costs; and
- minimal risk of pipeline damage.

This route planning was fully documented and, in March 1981, B. C. Hydro issued a Corridor and Route Nomination report to serve as the basis upon which government and public consultation on project routing could occur. That three-volume report provided relevant technical, environmental, and land use information on the pipeline routing nominated by B. C. Hydro. Extensive consultation then took place with federal and provincial resource agencies, municipal and regional governments, and the public.

Changes to the route B. C. Hydro nominated in 1981 were proposed during government and public consultation and these were examined carefully by B. C. Hydro. Where appropriate, further engineering and environmental studies on specific portions of the route were carried out.

As a result, B. C. Hydro has made significant changes in routing to accommodate government and public concerns as well as an increased awareness of terrain characteristics to and on Vancouver Island.

These changes are reflected in the preferred route for construction described in this report.

The route for the Powell River lateral has not been studied extensively. Suitable shore approaches on either side of the Strait of Georgia, and a technically feasible and environmentally acceptable pipeline route

between Vancouver Island and Powell River are likely to be found. Field studies have shown that there are likely technically feasible and environmentally acceptable pipeline routes for the land portions of the Powell River lateral.

The route for the Powell River lateral has not yet been subject to review by government or the public.

PREFERRED ROUTE

Including the Powell River lateral, B. C. Hydro's proposed system includes approximately 407 kilometres of pipeline facilities and, initially, one compressor station in Delta. A second compressor station may be required at Cedar Junction, in Year 7 of operation. The pipeline will consist of about 53 kilometres of dual underwater pipeline to Vancouver Island, 29 kilometres of single underwater pipeline from Vancouver Island to Powell River, and 325 kilometres of conventional buried land mainline, laterals, and sub-laterals.

The proposed pipeline will start at B. C. Hydro's Tilbury Gate Station, pass to a new compressor station located near the Tilbury industrial area in Delta, and then cross Delta to Brunswick Point near Canoe Pass. It will cross Roberts Bank and the Strait of Georgia to Valdes Island, cross Valdes Island, and cross Stuart Channel to land on Vancouver Island approximately one kilometre south of Flewett Point. The pipeline will continue a short distance inland to Cedar; from there a major lateral will run northwesterly to Campbell River and another south to serve Greater Victoria and the Saanich Peninsula. Sub-laterals off the northern branch will serve the Port Alberni and Powell River areas, and a sub-lateral off the southern branch will serve Crofton.

The preferred pipeline route is shown on maps 1 to 15 at a scale of 1:50,000.

Delta: Public consultation in Delta, and subsequent environmental and engineering work by B. C. Hydro, established the existence of a route through the municipality that accommodates most of the concerns of the Municipality, farmers, and the public.

The preferred route leaves the existing B. C. Hydro natural gas transmission system at Tilbury Gate Station in Delta and proceeds southward within an existing pipeline right-of-way to the preferred site for the compressor station, adjacent to and south of the British Columbia Development Corporation's industrial park at Tilbury.

From the compressor station site, the route lies mostly in undeveloped land in the Agricultural Land Reserve and follows the west fringe of Burns Bog where the ground contains less peat. North of the access road to the CONEX magazines, the route lies west of Delta's municipal sewer line. South of the CONEX access road, the route crosses to the east side of the sewer right-of-way to avoid Crescent Slough and the edge of the cultivated farm lands to the west of the slough.

After a right-angle approach to Highway 99, the route swings southward through mixed farming land, and proceeds adjacent to the eastern and southern boundaries of Holly Park subdivision before paralleling the existing electrical right-of-way running south from Arnott substation.

At 36th Avenue, the route diverges from the electrical right-of-way and turns westerly to avoid the congested area at the Roberts Bank overpass. Once across Highway 17, the route jogs southwards, rejoins the electrical right-of-way, and runs within or adjacent to that right-of-way until it swings south towards the Roberts Bank Coal Terminal. The preferred pipeline route continues west through cultivated farmland to Brunswick Point, the proposed starting point for the submarine crossing.

Valdes Island: Once across the Strait of Georgia, the route continues from a landing site north of Detwiller Point and rises in a southerly direction to a plateau. The route traverses the plateau in a westerly direction, avoiding a broken rock ridge, and then descends to sea level through a narrow pass bounded by Mexicana Hill to the south and a high shoreline ridge to the north.

This routing offers the shortest distance for construction while minimizing disturbance of water courses, and avoiding rock outcrops. The Islands Trust has confirmed their preference for a route across Valdes Island, subject to agreement on construction and routing detail, rather than one across any other Gulf Island.

Flewett Shore Approach to Cedar Junction: Once across Stuart Channel, the route continues from a landing site south of Flewett Point and proceeds westerly into the upland area. After crossing Ingram Road, the route deflects southwesterly to avoid pond areas and then northwesterly to avoid rock knolls and sandstone ridges.

After crossing Greenway and Yellow Point roads, the route turns westerly to reach the preferred site for the Cedar Junction valve station, west of Cedar Road. This site will also be used, in later years, for a compressor station.

Two public meetings at Cedar, and meetings with the Regional District of Nanaimo, have confirmed the acceptability of the preferred routing.

Cedar Junction to Langford Terminus: Several changes to the nominated route south of Cedar Junction have been made since the publication of the Corridor and Route Nomination report. Many of these changes are fairly minor, and have come about as a result of further field work undertaken by B. C. Hydro and comments made by local and regional governments on the nominated route. In particular, a review of the crossing locations for several major rivers was undertaken following the Department

of Fisheries and Ocean's comments on the nominated route. Their concern stemmed from the potential siltation and possible disturbance or loss of salmon spawning and rearing habitat that could result during construction of buried crossings along the nominated route.

The preferred pipeline route stays east of the Nanaimo River, proceeds around the south end of the Nanaimo Airport, and swings westerly across the Island Highway and the Esquimalt and Nanaimo (E&N) Railway to the existing 138 kV electrical transmission line right-of-way. The preferred pipeline route parallels the 138 kV electrical right-of-way until diverging to the east to a desirable site for an aerial crossing of the Chemainus River, west of the Island Highway.

Once across the Chemainus River, the route swings west, back to the 138 kV electrical right-of-way, and parallels that right-of-way to Cobble Hill, only diverging for aerial crossings of the Cowichan and Koksilah Rivers.

South of Cobble Hill, the preferred route is adjacent to the 138 kV transmission line to Spectacle Creek where the crossing is located to avoid Spectacle Lake Provincial Park.

South of Spectacle Creek, the preferred route continues adjacent to the 138 kV line until it departs to more closely follow existing access roads and avoid densely forested areas. This change is in keeping with concerns expressed by the local staff of the Ministry of Forests and the Victoria Watershed District.

The preferred route continues southward to the southwest corner of Goldstream Provincial Park. A buried crossing of the Goldstream River is proposed.

The route then swings east, crosses the E&N railroad twice, and follows an electrical right-of-way past Langford Lake to the site of the Langford Gate Station, which will feed distribution systems in the Greater Victoria area and the Saanich Peninsula.

Cedar Junction to Campbell River: From Cedar Junction, the preferred route proceeds westerly across the Nanaimo River, just downstream from its confluence with Haslam Creek, and crosses the Island Highway and the E&N Railway. Avoiding a steep descent of the escarpment that lies immediately north of the right-of-way of an abandoned railway, the preferred route swings north along that right-of-way to Extension. The preferred route crosses through a Ministry of Highway's gravel lease just east of the abandoned railway. Due to a large escarpment immediately to the north of the lease, it would be difficult to completely avoid this gravel lease. Minor adjustments in the preferred alignment, however, may be possible should the gravel reserve be further exploited.

From Extension to Brannen Lake, the preferred route rises to reach a pass through a rock ridge bounded by Westwood Lake and Mount Benson. It then descends to the rural area west of Nanaimo, keeping between Mount Benson and Jingle Pot Road and west of Brannen Lake.

To avoid conflict with a planned highway bypass route for the north end of Nanaimo, to avoid an area of congested land use, and to avoid difficult terrain conditions that exist along the 138 kV right-of-way, the preferred route between Brannen Lake and Nanoose Bay traverses the forested valley slopes in the drainage of Heikkla Brook and proceeds northward around the escarpment west of Lantzville. The route descends through a break in the escarpment to join the 138 kV right-of-way north of Arbutus Grove Provincial Park, traversing forested slopes on the north facing side of the escarpment.

There is a minor downstream diversion from the 138 kV right-of-way at Bonnell Creek to take advantage of a better crossing of the creek and recent clearing and land alterations on the west bank of the creek.

From Bonnell Creek to Craig Creek, the preferred route follows the east side of the 138 kV right-of-way. At Craig Creek, the preferred route swings east to achieve the preferred crossing site of the Englishman River. As the approaches to the crossing are gently sloped and erosion control on the banks is feasible, a buried crossing can be constructed with minimal environmental damage.

North of the Englishman River, the preferred route would return to the 138 kV right-of-way, thereby avoiding two highway crossings of the Parksville bypass and requiring a single, relatively simple, crossing of Highway 4 to Alberni.

North of the Englishman River, the preferred route follows the northeast side of the 138 kV right-of-way to Alberni Junction. The route departs from the electrical right-of-way to avoid the electrical substation at Parksville and to reach a better crossing of the Little Qualicum River downstream of the 138 kV crossing.

From the Little Qualicum, the preferred route follows the electrical right-of-way as far as Alberni Junction. Here it makes a sharp turn to the east to cross the Qualicum River and Hunts Creek, just upstream of the railway bridge, at a site agreed with the Department of Fisheries and Oceans.

North of the Qualicum River, the preferred route runs adjacent to or within a proposed route for the Island Highway which was gazetted in 1950 but which may not now be required.

The preferred route briefly returns to the 138 kV right-of-way for the crossing of Cougar (Cowie) Creek, then leaves it to cross the Tsable River, rejoining the electrical right-of-way just north of the river. The route parallels the 138 kV right-of-way until after crossing Hindoo Creek, where it swings easterly away from the electrical right-of-way to cross a number of creeks and the Trent River.

The preferred route swings west after crossing the Trent, rejoining the electrical right-of-way. The route crosses the electrical right-of-way to avoid the built up area near Courtenay and crosses back over it for the best crossing site of the Puntledge River. After crossing the Puntledge, the preferred route swings toward the coast and follows the broad, low ridge between the valleys of the Tsolum River, Black Creek, and the lower Oyster River and the eastern shoreline. Merville Junction (for the Powell River lateral) will be located in this section.

The Campbell River terminus would be located close to the southeast corner of the Quinsam Indian Reserve.

Alberni Lateral: The preferred route for the lateral to Alberni leaves the main north/south route near the Qualicum River, and runs in a southwesterly direction to the north end of Illusion Lake, skirting the boundary of a private gravel lease northeast of the lake and largely avoiding a new subdivision currently being developed east of the lake.

The route skirts the south side of Horne Lake, rises to a saddle overlooking the lake, and proceeds down the western slope of Mount Horne.

The preferred site for the terminus is located in Crown land east of Alberni.

Powell River Lateral: The route for the lateral to Powell River leaves the main north/south route south of Merville, and runs east to a shore station near Little River. The route crosses the Strait of Georgia, passing north of Harwood Island, to a shore station north of Scuttle Bay, in the Sliammon Indian Reserve. The route crosses the Reserve to a terminus located midway between the mill and Westwood.

FOR FURTHER INFORMATION

If you want more information about the Vancouver Island natural gas pipeline, here's how to get it:

- Copies of B. C. Hydro's Corridor and Route Nomination report are available for viewing at local public libraries, community colleges, and at our head office in Vancouver. While quantities last, you can also get summary of the report by contacting the office listed below.

- If you have any other questions or want any other information, please contact Lorna Barr at:

Community Relations Department
B. C. Hydro
970 Burrard Street
Vancouver, B. C.

Telephone: 663-4278

SECTION 1
INTRODUCTION

In March 1981, B. C. Hydro issued its Corridor and Route Nomination report for the proposed natural gas transmission pipeline to serve Vancouver Island. That report was prepared to meet the requirements of the Guidelines for Linear Development issued by the B. C. Environment and Land Use Committee (ELUC).

Following the release of the Corridor and Route Nomination report, Hydro asked for comment on the nominated corridor and route from federal and provincial resource agencies, municipal and regional governments, and the public. This was done so, after reviewing the comments, Hydro could revise the nominated route where appropriate, and present the revised route to the regulatory authorities as the preferred route for construction.

The objective of this report is to provide the analysis leading to the selection of the preferred route for construction. This report summarizes the comments received on the route nominated in the Corridor and Route Nomination report and the manner in which Hydro has considered and incorporated those comments in locating the preferred route. This report also presents the route proposed to serve Powell River.

The attached series of maps should be used in conjunction with this report as they show the preferred route and the route options considered in this analysis. The information on resources and land use that was included in the Atlas Volume of the Corridor and Route Nomination report is not repeated here; however, readers are advised to use that document as a background reference for this report. Copies of all three volumes of the Corridor and Route Nomination report are on view at local public libraries and community colleges, and at Hydro's head office in Vancouver.

SECTION 2
PUBLIC CONSULTATION

2.1 OBJECTIVES

To ensure that alternate points of view are taken into account, public consultation has been carried out as an integral part of Hydro's studies for identifying potential routes for a natural gas transmission pipeline to and on Vancouver Island.

Public consultation, initiated by Hydro for the proposed Vancouver Island natural gas project, has two major objectives:

(i) provide government ministries and agencies, local authorities, public interest groups, and local people with an opportunity to be well informed about the project.

(ii) provide them with a means for expressing their desires and concerns as they relate to the project so that Hydro may consider them during planning, design, construction, and operation.

Hydro's public consultation initiatives have been in accordance with the requirements and objectives of the Guidelines for Linear Development

issued by the Environment and Land Use Committee (ELUC) of the provincial cabinet, and with the Guide to the Energy Project Review Process, issued in January 1982, by the Ministry of Energy, Mines and Petroleum Resources.

2.2 BACKGROUND

As part of the Linear Guidelines process, a project Prospectus was submitted to the now-disbanded ELUC Secretariat in January 1979. This prospectus, which gave the provincial government and the public a general description of the project, its purpose, and the studies proposed by Hydro to determine the best route based on the environmental and technical factors associated with feasible route alternatives, provided a basis for preliminary consultation with provincial ministries.

This was followed in May 1979 by wide distribution of a General Description report to local authorities in the study area, public interest groups, and the general public. The report described the basic elements of the project: its purpose, the study area, the outlook for a sufficient natural gas supply in British Columbia, the social and environmental aspects of the project, pipeline construction and operation methods, and project timing and planning procedures. Also, the report described Hydro's public consultation program and its integration with project-related studies.

Distribution of the General Description was followed by a series of informal meetings with the provincial government, regional governments, municipal officials, and interest groups, to acquaint them with the ELUC Linear Guidelines process to be followed in the route location studies.

During the route location studies, undertaken in 1979 and 1980, Hydro staff and consultants contacted the professional staff of government agencies and others who had particular knowledge of the study area. The resultant information was included in the three-volume report entitled Corridor and Route Nomination For Vancouver Island Natural Gas System (December 1980).

The purpose and scope of that report, upon which consultation with government agencies and the public is based, is best described by the following quote from page XV of the "Text" volume:

> "This report describes B. C. Hydro's proposed project to provide natural gas service to Vancouver Island's residents and industries. This report explains the reasons for the nomination of a preferred corridor, and a preferred route within that corridor, for the transmission pipeline."
>
> "An analysis leading to the nomination of a pipeline corridor, based on technical factors and a comparative review of environmental impact, resource impact, social impact, cost, and operating criteria, is presented. The significant environmental issues relating to construction of the project in the nominated corridor are identified, and the means by which they might best be resolved are suggested."
>
> "A preferred route within the nominated corridor, based on a review of route options within the corridor, and the impacts associated with each, is presented."

In essence, the Corridor and Route Nomination report was designed to serve as the major information document for public review of the route alternatives for the project to and on Vancouver Island.

2.3 METHODS

Distribution of the Corridor and Route Nomination report began in March 1981, a month following an announcement from the Provincial Ministry of Energy, Mines and Petroleum Resources directing B. C. Hydro to submit an application, under the Utilities Commission Act, to build a pipeline to supply natural gas to Vancouver Island.

The general method used to identify and ensure that all points of view on routing were taken into account was as follows:

- widely distribute the Corridor and Route Nomination report and its Summary;

- advertise the availability of information; and
- actively seek out comments and concerns on the nominated route and its alternatives.

As a dynamic process, adjusting to a variety of intervening variables, this was done as follows:

(1) Copies of the Text, Atlas, and Summary volumes of the Corridor and Route Nomination report were distributed for evaluation and comment to those individuals and groups whose responsibilities will be directly affected by the project, and to others with a significant interest (provincial and federal resource agencies and committees, regional districts and municipalities in the study area, farmers' institutes, and environmental groups). Complete sets of the report were made available for public viewing at regional libraries, and community colleges, at Hydro district offices on Vancouver Island and in Delta, and at Information Place at Hydro's head office in Vancouver.

(2) As a first step in providing project information to a wider audience for review and comment, copies of the Summary volume were distributed to a variety of local interest groups and individuals in the study area (Chambers of Commerce, union locals, Members of Parliament and the Legislature in the study area, Indian Bands, and agricultural and trade associations). The complete Corridor and Route Nomination report was provided on request.

(3) Approximately 300 copies of the Corridor and Route Nomination report, and a further 500 copies of the Summary, were distributed.

(4) In conjunction with public distribution of the reports, Hydro issued a comprehensive news release on 11 March 1981. It described the Corridor and Route Nomination report and its role in the Linear Guidelines process, summarized corridor and route nomination and

the result, outlined where the full report could be viewed, and listed an address and telephone number for anyone wishing to request their own copy of the Summary volume. Most of this information was repeated in Hydro's May/June, 1981, Service Digest, mailed to all Hydro customers in the province.

(5) In addition to responding to requests for more information, or clarification of information in the Corridor and Route Nomination report, Hydro's project staff systematically sought meetings with all those individuals and groups whose responsibilities would be directly affected by the project. This resulted in meetings with the following:

- representatives of federal (Environmental Protection Service, Lands Directorate, Department of Fisheries and Oceans, etc.) and provincial (Ministry of Environment, Ministry of Highways, Agricultural Land Commission, etc.) resource agencies and committees;
- the Islands Trust;
- Mayors and/or councils, or their representatives of Campbell River, Central Saanich, Comox, Courtenay, Cumberland, Delta, Duncan, Esquimalt, Ladysmith, Lake Cowichan, Nanaimo, North Cowichan, North Saanich, Oak Bay, Parksville, Port Alberni, Saanich, Sidney, and Powell River; and
- elected and/or staff representatives of the Alberni-Clayoquot, Capital, Comox-Strathcona, Cowichan Valley, Greater Vancouver, and Nanaimo regional districts.

(6) Meetings were also sought and held with other interest groups in the study area, including:

- the Delta Farmers' Institute and the Cowichan Agricultural Society and Farmers' Institute;
- the Cowichan and Qualicum Indian Bands; and
- Chambers of Commerce.

(7) Input from the above-mentioned meetings was used to refine the nominated corridor and route, and open public meetings were scheduled for August 1981. The Hon. Robert McClelland, in February 1981, instructed Hydro to apply to construct the transmission line from the Mainland to Vancouver Island. Hydro limited the public meetings to the Delta and Cedar areas at that time. Held on 4 August (Cedar) and 6 August (Delta), these meetings involved:

- newspaper, radio, and poster announcements of the meetings;
- preparation and distribution of a project information brochure prior to the meetings;
- Hydro staff and consultants at the meetings to review the results of corridor and route nomination, and to answer questions from the general public.

(8) At the request of Cedar Director Mr. Stuart Wright of the Nanaimo Regional District, Hydro project staff attended a second public meeting in Cedar (5 October 1981) to provide information and answer questions on the proposed pipeline.

(9) During September and October of 1981, the distribution of the Corridor and Route Nomination report was followed up one last time by letters to those who had reviewed, but who had not yet commented on the nominated corridor and route. The letters outlined what had taken place since March, and pointed out that:

> "Substantive comments and reactions to the Corridor and Route Nomination report are now being analyzed so that they may be used to help work out the best possible route."
>
> "If you have not yet forwarded your comments and wish to do so, we would appreciate receiving them so we can ensure that they will be fully considered."

2.4 RESULTS

The results to date of the consultation process with government authorities and local interest groups are provided in the following pages of this report. Public responses to the nominated corridor and route, major issues and concerns, and the potential resolution of such issues and concerns, are detailed.

2.5 FURTHER CONSULTATION INITIATIVES

While the writing of this report may imply that public consultation concerning Hydro's preferred route has been completed, this is not the case. Distribution and follow-up for this report is the next major public consultation initiative by Hydro.

Copies of the report have been distributed for evaluation and comment to those individuals and groups that took part in the evaluation of the Corridor and Route Nomination report, and to any others with a significant interest in the project. Copies of the report have been made available for review at publically accessible locations (e.g. Hydro offices and local libraries). The general public has been informed, through the media, of the availability of information on the project.

To obtain public commentary on the result of the route location studies, and to inform the public, Open Houses will be held in communities in close proximity to the pipeline route. Staffed by Hydro project staff, these information centres will also provide the public with knowledge about the various components of the Hydro proposal, prior to the Energy Project Certificate hearing for the project.

When the project enters the hearings phase, Hydro project staff will continue to provide project information, and to attend local interest group meetings, as requested. Project information leaflets will be published and distributed.

The goal of the public consultation program during the post hearing phase will be to maintain an ongoing dialogue with those individuals or groups interested in, or affected by, the detailed design, construction, or operation of the project.

The major objectives will be:

(i) to provide information about the detailed aspects of the project; and

(ii) to provide the public with an opportunity to monitor the project as it progresses.

The consultation program will include the issue of news releases at key points in the project, the publication and distribution of project status reports, information leaflets and supporting technical documents, the maintenance of information centres in selected communities, and the scheduling of open houses in locations affected by the project.

SECTION 3
DETAILED ANALYSIS OF PREFERRED ROUTE

3.1 COMPRESSOR STATION

In the Corridor and Route Nomination report, three sites for the main compressor station were identified: a site at the northwest corner of the BCDC industrial land at Tilbury, the vacant portion of B. C. Hydro's land adjacent to the LNG plant on Tilbury Island, and a site opposite Hydro's land on Tilbury Island. The latter site soon became unavailable as it was sold for industrial development. A fourth site, that lies adjacent to and south of the southwest corner of the BCDC property, was suggested at a public meeting in Delta. The three available sites are shown on Map 1 and are referred to as Site "A" (Hydro land), Site "C" (BCDC land), and Site "D" (adjacent to BCDC property).

The physical requirements of a compressor station site include the following: it should be a square area of at least four hectares, so that noise levels at the boundary fence meet municipal noise standards; adequate road and pipeline access to the site should be available; acceptable foundation conditions should exist for the compressors and

associated buildings; and water, sewer, and electricity should be available at reasonable cost. All three sites met these basic physical requirements.

Initial attention focussed on Sites A and C, but a choice could not be made until Hydro decided whether or not to use Site A for a proposed expansion of existing liquefied natural gas (LNG) storage facilities. In July 1981, Hydro concluded that Site A did not meet the present requirements for expansion of LNG storage; consequently, the site became available for consideration.

A comparison of Sites A and C was made, and two key factors favoured the Site C:

- it would involve a more direct route from Tilbury Gate Station to the compressor station, with resultant cost savings;
- it would avoid double crossings of River Road, the railway, and Tilbury Slough that would be necessary for the inlet and outlet pipelines to Site A.

These factors, however, were outweighed by the benefits of Site A to Hydro and the municipality of Delta for the following reasons:

- Hydro already owns the Site A land; use of Site C would require the purchase of four hectares of industrially-zoned land at a substantial cost.

- Use of the industrially-zoned Site C land for a compressor station would result in a below-normal development density, with subsequent reductions in tax revenue that would otherwise accrue to the municipality of Delta.

The proposed location of the compressor station at Site A and the nominated route through Delta were presented at a public meeting in Delta in August 1981, where a suggestion was made for an alternate site for the

compressor station immediately south of the BCDC property (Site D). A comparison of Sites A and D drew the following conclusions:

1. Preliminary soils investigation of Site D showed that this site is acceptable for construction of a compressor station; it has similar soil conditions to Site A;

2. Site D would result in a saving in construction costs of approximately $1,000,000. Site D permits a direct pipeline route from Tilbury Gate Station, and avoids the difficult and expensive construction involved in crossing River Road, Tilbury Slough, and the Burlington Northern railroad that would be necessary to reach Site A.

3. Tilbury Slough is owned by Fisheries and Oceans Canada and is being studied for fisheries and waterfowl habitat protection and enhancement. Pipeline construction through the slough may have adverse environmental impacts.

4. Site D would accommodate the concerns of local farmers who prefer that use of agricultural land for the pipeline right-of-way (ROW) be kept to a minimum. The pipeline route from Tilbury Gate Station to Site D would lie within an existing B. C. Hydro ROW between nodes 0 and 2, would be adjacent to the south boundary of the BCDC industrial land between node 2 and Site D, and be adjacent to the edge of Burns Bog from Site B to node 4. In contrast, the pipeline route south of Site A would require additional ROW through land south from River Road to node 5.

5. Site D has never been cultivated but lies within the Agricultural Land Reserve (ALR). From discussions with the property owners, it appears that the only suitable agricultural use for this property is for cranberry production as most of it is bog. In 1982, most of the parcel which includes Site D was developed for cranberry production.

6. Site D would involve the purchase of approximately four hectares of land at a cost that can only be estimated at this time. Its present owners have developed the adjacent land for cranberry production. As Hydro presently owns the land at Site A, no value has been attached to it in the comparison of costs of the two sites. Clearly, this land has considerable value should Hydro dispose of it; therefore, any reasonable value assigned to Site A would increase the relative capital cost savings estimated for Site D by the same amount.

7. Both Site A and Site D are in areas where a compressor station would be consistent with other industrial park developments.

8. In addition to differences in land costs and construction costs associated with pipeline routing to and from the two sites, there could be differences associated with operating costs at the sites. Potential savings in services and manpower might be available at Site A by combining operations with the existing LNG Plant.

Conclusion

There are advantages and disadvantages associated with both sites, but Site D was preferred over Site A primarily due to the obvious technical advantages and because it best accommodates the concerns of local farmers and the Municipality of Delta. The uncertainty surrounding the future availability and cost of Site D, however, requires Hydro to retain Site A as an alternative. Other sites can also be investigated during the detailed design phases of the project.

3.2 DELTA

3.2.1 Major Issues

The route through Delta described in the Corridor and Route Nomination report was nominated by Hydro without regard to land tenure on the assumption that construction of the pipeline would have no long term impact on agriculture, and short term impacts on agriculture would be accommodated by monetary compensation. On the basis of these assumptions, the nominated route was the shortest route offering acceptable levels of impact on society, the environment, and resource uses other than agriculture.

At meetings with municipal staff and council members in Delta, and with representatives of the Delta Farmers' Institute, two major points emerged:

1. The municipality and farmers strongly preferred a route that made maximum use of existing transport or utility corridors.

2. The municipality and farmers preferred to see the east-west portion of the route further south than the nominated route, across land that is leased by farmers from the B. C. Harbours Board, rather than land owned by the farmers themselves. The municipality did not want to see a new ROW close to the south side of Ladner which might restrict its future growth.

Crescent Island was identified as an area of very high agricultural value as it is farmed intensively to produce vegetables. As access to the land is generally along east-west roads, it would be highly desirable to have the pipeline as far east as possible to minimize disruption to farming activity between the pipeline and the eastern boundary of the agricultural land during construction.

Farmers expressed a strong concern that pipeline construction not impair the present land drainage systems, or the opportunity to install deeper drain systems in the future. It was also mentioned that heavy tractors and farm equipment were used in Delta, and it was important that the presence of a pipeline ROW not restrict their use.

The possibility of joint use of Hydro's existing electrical ROW's was considered in depth. Meetings were held with managers of electrical ROW'S through Delta to determine where the pipeline could be accommodated within, or adjacent to, an existing ROW. The major factors considered were required clearance from electrical transmission lines and Hydro's future plans for use of these ROW's.

The proximity of the pipeline to the existing railway ROW was also considered. It was established through discussions with the B. C. Harbours Board, owner of the railway that, in the interests of safety, the pipeline should maintain a minimum distance of 50 metres from the railway.

3.2.2 Route Selection Through Delta

The preferred route through Delta is shown on Map 1.

Assuming that the compressor station is located at Site D, the route would start at the Tilbury Gate Station and proceed south within an existing Hydro gas pipeline ROW. The route would turn west at node 2 towards the compressor station site. From the compressor station, the route would run south to node 4 through the undeveloped land east of the farmland and west to node 5, adjacent to the fence, crossing developed farmland.

Several other route options were reviewed but were rejected for several reasons. For example, it would be possible for the pipeline to run east from the station to node 2, continue south to node 3 and either west to node 4 or southwest to node 6.

The route from node 3 to node 6, which had been suggested by the Municipality of Delta, was rejected as it would involve a new ROW across a major, undisturbed area of Burns Bog which poses difficult construction problems and is under consideration by the GVRD for a landfill site.

The route from the compressor station site via nodes 2, 3, and 4, 5 was rejected in favour of going to 5 directly through 4 as the former route would be longer, more costly, and does not offer any environmental benefits.

From node 4, there are two possible routes south: routes 4-6-7 and 4-5-7. Route 4-6-7 makes use of the existing Hydro ROW south through Burns Bog, passes close to the east side of the CONEX magazine, and runs along the west side of the City of Vancouver's landfill site. After crossing Highway 99 south of the landfill, it turns west to node 7, traversing agricultural land adjacent to an existing Hydro ROW. Land use in this area may change as the GVRD is seeking to develop the section north of the Vancouver landfill site as a landfill for the GVRD. Access to the new site may require removal of the magazines. At the time of writing, final arrangements for the access were unknown.

Route 4-5-7 follows the north and west fringe of Burns Bog where the ground contains less peat than that in the bog. From nodes 5 to 7, it lies mostly in undeveloped land within the ALR. North of the access road to the CONEX magazines, it lies west of the municipal sewer line, and crosses to the east side of the sewer south of the road. The route avoids crossing Crescent Slough by following it some 30 metres to the east, allowing a right-angle approach to the Highway 99 crossing. The route continues to follow Crescent Slough westward, then turns south through farmland to node 7. The location of the pipeline ROW at node 7 is fixed by the eastern boundary of the Holly Park subdivision to the south.

In summary, route 4-5-7 is strongly preferred over 4-6-7 for the following reasons: it has better soils for construction and would have less impact on Burns Bog; it avoids the potential problem of disposing of leachate from the existing and proposed landfill sites during construction or during future maintenance when a trench would have to be dewatered; it offers a better location for the highway crossing; and, it results in less disturbance of cultivated farmland south of the highway.

Between nodes 7 and 8, there are no changes to the nominated route. It would cross farmland along the eastern boundary of the Holly Park subdivision.

To select a route beyond node 8, it was necessary to review land use constraints between node 8 and Brunswick Point. The nominated route was strongly opposed by the farming community and the municipality who were in favour of a more southerly route adjacent to Hydro's electrical ROW. Hydro, therefore, reviewed its estimates of construction costs, land aquisition costs, and compensation for crop losses along the nominated route and a variety of alternate routes between nodes 8 and 20, and from nodes 20 through 21, and 23 to 26. It was concluded that the differences in costs were not sufficient to continue to press for the nominated route and, in view of local preferences, the route 20-21-23-26 was selected as the westerly portion of the preferred route in Delta.

The preferred route lies within the electrical ROW from node 20 to 21. At node 21, the electrical ROW veers southwest. One route option would follow the electrical ROW from node 21 to 22 and then run inside the dyke to node 23. This option was rejected as it would cross more cultivated farmland than the preferred route, parallel the drainage ditch behind the dyke and cross many lateral drains, and interfere with farm buildings near node 23.

One of the more complicated issues in Delta concerned the routing of the pipeline from the north-south leg to the east-west section of the existing electrical ROW extending towards Brunswick Point. Between nodes 8 and 20, seven route options were considered; these are shown on Map 1.

The advantages and disadvantages of the various components of these route options are as follows:

8-9-12 The pipeline must be located far enough from the railway ROW to allow unrestricted use of heavy equipment adjacent to the railway and to prevent damage to the pipeline if a derailment occurred. A 50 metre clearance was considered appropriate. This clearance, however, would force the pipeline ROW to infringe onto the farmland, contrary to the preferences of the farmers and the municipality. In addition, this route would closely skirt the farm building complex near the intersection of 64th Street and the B. C. Harbours Board Railway. This potential conflict is common to all of the following route options passing through nodes 13, 14 and 15.

13-18-20 This section would cross through the highway interchange, requiring three separate road crossings. According to Ministry of Transportation and Highways, there are plans to modify the interchange in the future. Although this routing would be adjacent to the north side of the electrical ROW, as recommended by the local farmers and municipal planners, it was rejected by Hydro due to the technical difficulties associated with crossing the interchange and the potential interference should the interchange be reconstructed to accommodate a connection to Highway 99 to the east, as has been proposed by the Ministry of Transportation and Highways in the past.

14-19-20 This section is aligned with the south side of the electrical ROW. It would have the same problems associated with the highway interchange as 13-18-20. It would have the added difficulty of being immediately adjacent to the drainage ditch along the Roberts Bank superport access road where it could interfere with drainage systems, and create technical difficulties during construction.

14-15-19-20 This routing was suggested by the municipality but poses numerous technical difficulties: it would require two additional railway crossings; it would be a southward extension of the existing utility corridor through Delta, while all others are to the north; and it could interfere with the Ministry of Transportation and Highway's plans to modify the highway interchange that may include loops south of the railway.

10-16 and 11-17 These run through farmland. Section 11-17 is further from farm buildings and closer to property lines.

17-18 This section lies in farmland but passes close to two sets of farm buildings.

Routes 13-18, 14-19, and 14-15-19 were considered to be less desirable than other routes that would avoid the highway interchange. Routes 14-19 and 14-15-19 are even less favourable due to the extra construction difficulties they would involve.

Routes 13-18, 14-19, 14-15-19, and 9-12 were all rejected. As route 11-17 is marginally preferred over 10-16, the preferred route from node 10 becomes 10-11-17-18-20.

Route 8-9-10 was preferred over 8-10 because it is further from the railway and is much closer to road access for delivery of material.

The preferred route through Delta was thus defined as O-2-Site D-4-5-7-8-10-11-17-18-20-21-23-26. This route is highlighted on Map 1.

If Site D becomes unavailable, some re-routing of the pipeline would be necessary to serve the alternative site on Tilbury Island. The route between the Tilbury Gate Station and Site A would be defined as: O-1-Compressor Station Site A-1-5; there are no other route options available in this section. This is shown as the preferred alternate route on Map 1.

3.3 ROBERTS BANK

Three route options across Roberts Bank were reviewed by Hydro and discussed in the report entitled Environmental Impact Assessment of Construction of a Natural Gas Pipeline Across Roberts Bank, (February, 1982). The preferred route has been relocated slightly to avoid the sensitive marsh habitat at Brunswick Point. The pipeline would come ashore at the site of the old cannery buildings, recently demolished by the B. C. Harbours Board, owners of the site.

Route B was chosen because it would require the shortest construction period, has the shortest crossing of Canoe Pass, and would avoid the tidal marshes at Brunswick Point. The shorter period of dredging within the proposed schedule would incur fewer potential impacts on fish, and the shorter construction period in Canoe Pass would reduce interference with people's activities in Canoe Pass and the adjacent area. This is particularly relevant when comparing Route B with any other route option that would extend upstream in Canoe Pass beyond the old cannery and cross the dyke to the east of the cannery.

3.4 GEORGIA STRAIT

Hydro has refined the underwater crossing following a detailed survey of the shore approaches.

3.5 VALDES ISLAND

The design of the project has altered since the Corridor and Route Nomination report was issued in that the crossing of Valdes Island would involve twin pipelines laid in a common ROW in place of a single pipeline with two shore valve stations. The two shore valve stations have been rejected in favour of a central valve station that would include cross-overs between the twin pipelines to give maximum flexibility for operation, maintenance, and repair of the submarine pipelines. Elimination of the shore stations would reduce visual impacts on the Valdes coastline.

The preferred route on Valdes Island is shown on Map 2. Changes in routing were made to take advantage of a shorter distance, to minimize disturbance of water courses, and to avoid rock outcrops. The route is on land that is owned by MacMillan Bloedel Ltd. and is managed as a tree farm.

Construction access will be from the west side where a landing ramp for barges, and a dock for small boats will be constructed.

3.6 STUART CHANNEL

The underwater crossing of Stuart Channel has not changed appreciably since the Corridor and Route Nomination report was issued. The approach to the landing site on Vancouver Island has shifted southward from the nominated route; the details are discussed in Section 3.7.1.

3.7 FLEWETT SHORE APPROACH TO CEDAR JUNCTION

The nominated route would land on the east coast of Vancouver Island just south of Flewett Point, with the pipeline running inland through farmland and wooded areas to Cedar Junction. At Cedar Junction, the transmission pipeline would branch south towards Victoria and north to Campbell River.

Since the Corridor and Route Nomination report was issued, further technical work has been done to more closely define the shore approaches, possible land routings, and possible locations for a junction near Cedar where a site is required that will permit construction and operation of a compressor station in the future. To achieve noise levels at the boundary that conform to normal bylaws, a square site of about 4 hectares is required.

3.7.1 Shore Approaches

In the Corridor and Route Nomination report, it was proposed that the marine pipelines would come ashore on Vancouver Island just south of Flewett Point, roughly in the vicinity of Sites A and B shown on Map 2. A landing in this area offered the most direct route for the pipeline between the shoreline and the preferred location for Cedar Junction, Y_3, and it was considered to be feasible in terms of marine pipeline construction.

At the time that this initial choice of a shore approach was made, the hydrographic survey of the pipeline route in Stuart Channel had extended only to within approximately 500 metres of the shoreline. It was therefore necessary to complete the survey to more closely determine the nature of the intertidal and subtidal areas closer to shore.

In 1980, a bathymetric survey that extended roughly 450 metres south of Site A was done, enabling the bottom contours to be mapped from the low tide mark out to an approximate depth of 30 metres. A side scan sonar survey that identified the major features and texture of bottom sediments was completed for the same area in 1981. In October 1981, divers examined the near-shore areas and confirmed the results of the previous acoustic surveys. From this information, a much more accurate picture of the nature of the underwater topography near Flewett Point was obtained.

The landings at Sites A and B are similar in terms of construction of the shore approaches. Both would involve blasting a trench in a partially submerged rock ridge that extends south from the southern tip of land just south of Flewett Point. Construction of the trench would involve blasting approximately 350 metres at a cost of approximately $1.5 million (1981 $).

A route was found farther south that would avoid all the major underwater reefs offshore and would only require a fairly short trench (70 metres) to be constructed from the shoreline. This site, E, was much preferred from the perspective of marine pipeline construction as it represents a cost saving of a roughly $1.3 million over Site A and a reduction in the length of time needed for excavation.

Sites C and D were identified as possible shore approaches between Sites B and E. Both C and D, though requiring somewhat less blasting through offshore reefs than would be necessary at Sites A and B, would not achieve the maximum cost saving represented by Site E. Furthermore, the shoreline at D is flanked by a cliff that is roughly 4 metres high, and poses additional construction difficulties over a landing at Site E.

If it was desired to route the land pipeline south of Quennell Lake, it would be preferable to locate the shore approach slightly south of Site E in order to achieve a more direct route for the land pipeline. The initial hydrographic survey for the pipeline showed that no suitable shore approach exists south of Site E that would not incur a substantial additional cost for the marine construction. Such an additional cost would greatly outweigh any cost savings that might be realized as a result of a more direct routing for the land pipeline.

In conclusion, the technical and economic advantages of landing at Site E resulted in the selection of this site as the preferred shore approach on Vancouver Island.

3.7.2 Land Routing

Routing opportunities between the Flewett shore approach and the 138 kV transmission line further inland, which is a preferred route, are limited by several geographical constraints.

First, Quennell Lake presents technical difficulties for pipeline construction. The soft organic soils of the lake bottom and the rock ridges that would have to be crossed to reach and cross the lake constitute difficult terrain for pipeline construction. Consequently, there would be increased potential for environmental damage, due in part to the need for heavy equipment that would have to be transferred to the island in the middle of the lake. It was decided, therefore, that a route across Quennell Lake was not acceptable even though it represents the most direct route inland from the landing at Site E.

Second, there are few acceptable locations for a buried crossing of the Nanaimo River. From a technical perspective, a buried crossing upstream of the confluence of the Nanaimo River and Haslam Creek would encounter adverse terrain conditions and the pipeline would also have to cross Haslam Creek; whereas downstream of the confluence, the terrain is much flatter, relatively homogenous, and more suitable for a buried crossing. That stretch of the Nanaimo River downstream of its confluence with Haslam Creek for 2 kilometres was found to be the only suitable stretch within which a buried crossing could be located.

Two potential buried crossings sites were identified and are shown on Maps 2 and 3. They differ in that the upstream crossing would avoid the gravel beds that are important spawning areas but has a greater potential for siltation due to the higher content of finer silts and sands in the river substrate. The downstream crossing is mostly in gravels and would, therefore, have less potential for siltation but would cross the spawning beds. The surface gravels, however, could be stripped and replaced after the pipeline was installed, resulting in no permanent

effect on the spawning habitat. In terms of construction, the two sites are of comparable difficulty.

The option does exist, however, to construct an aerial crossing over the Nanaimo River. Such a crossing would not be suitable in the lower reaches of the river due to the need to erect large structures from which to suspend the pipe over the river and the possible interference these may cause with the approach path to the Cassidy airport. If an aerial crossing was proposed, a more suitable location would be in the upper reaches of the river in the vicinity of the 138 kV transmission line crossing.

The relative merits of constructing a buried or an aerial crossing of the Nanaimo River has been reviewed carefully by Hydro, and the preference for a buried crossing remains. The basic reasons for this are as follows:

1. Construction of an aerial crossing of the Nanaimo River would roughly be twice as costly as a buried crossing in the proposed location.
2. An aerial crossing would be more exposed to risk of third-party damage to the pipeline.
3. A buried crossing of the Nanaimo River was successfully completed in the summer of 1981 by the Regional District when two water mains were installed near the Cedar Road Bridge in the vicinity of the proposed pipeline crossing.
4. A buried crossing in the proposed location would result in considerable saving in terms of the total cost of the pipelines leaving Cedar Junction, for reasons that are explained in the following paragraphs.

   In the Corridor and Route Nomination report, it was proposed that the transmission system on Vancouver Island branch near Cedar (south of Nanaimo), with the northern leg running inland to where it would join the abandoned railway ROW and the southern leg going south around Cassidy airport to reach the 138 kV transmission line.

In light of the subsequent change in the preferred location of the shore approach, the complexities of locating a suitable junction site, and the response from the Department of Fisheries and Oceans stating their preference for an aerial crossing of the Nanaimo River, a review of alternate junction formations was undertaken.

As shown on Map 3, there are four basic options for the pipeline junction configuration near Cedar;

(1) a route north of Quennell Lake, with the pipeline branching in the vicinity of Cedar, east of the Nanaimo River;
(2) a route south of Quennell Lake, with the pipeline branching at a junction site near the southwest end of the lake;
(3) a route north of Quennell Lake, with the pipeline branching near its junction with the 138 kV transmission line, west of the Nanaimo River;
(4) a route either north or south of Quennell Lake, with the pipeline branching near the 138 kV line, but southwest of the Cassidy Airport.

Options (1) and (2) would both require a buried crossing of the Nanaimo River downstream of Haslam Creek. The terrain does not present any substantial difficulty for pipeline construction; however, the route south of Quennell Lake would require clearing through approximately 4.6 kilometres of forested land, some of which would be through an established tree farm, as compared to 2.5 kilometres for northern route. The difference in length of the routes and capital costs also favoured the route north of Quennell Lake.

Options (3) and (4) are longer and more expensive than either (1) or (2). Option (3) was rejected because it would require two crossings of the Nanaimo River - a buried crossing in the preferred location, and an aerial crossing farther upstream where the southern

leg of the pipeline would cross the river near the 138 kV line. Haslam Creek would also have to be crossed slightly further south. Given that one of the primary objectives in route selection was to minimize the potential impact on the aquatic environment, Option (3) was clearly the least desirable configuration of the four considered.

Option (4) would require a single crossing of the Nanaimo River by the northern leg of the pipeline. This could be accomplished using either an aerial or buried crossing, although the location of this buried crossing site is less desirable from a technical and environmental perspective than the preferred site downstream. An aerial crossing was, therefore, preferred for this configuration.

In conclusion, a choice between Option (1), utilizing a buried crossing of the Nanaimo River, and Option (4), using an aerial crossing of the river, resulted a strong preference for Option (1). The buried crossing is preferred on the basis of pipeline security and construction costs. In addition, a crossing of Haslam Creek would be avoided, and the shorter length of pipe between the shore approach and the junction site would result in a significant cost saving.

3.7.3 Site Selection for Cedar Junction Valve Station

Having adopted Option (1) as the junction configuration, Hydro undertook a review of several sites for the Cedar Junction valve station. The valve station requires an area approximately 100 x 100 metres (1 hectare). Five possible sites were identified, including the site Y_3 that was nominated in the Corridor and Route Nomination report. The sites were compared in terms of surrounding land use, visual impacts, terrain conditions, costs, and the associated pipeline routings and river crossings. These five sites are shown on Map 3.

Y_1 is located on the east side of Yellow Point Road just north of Quennell Lake, along the preferred route. The site is in a slight depression and is partially forested at present. Most of the existing vegetation would be removed if the valve station were located here, exposing the station to travellers along the road. As it is the closest to the shore approach, it represents the shortest and least costly route for the large diameter pipeline. The major disadvantage of this site is that there are several residences nearby: it would be difficult to visually screen the station from either the road or the residences, and the houses are too close to the site for its use as a site for a compressor station.

Y_2 is also situated along the preferred pipeline route, between Y_1 and Y_3. Terrain conditions are much less favourable due to the wetness of the ground immediately east of Quennell Road. The location can be seen from the road and would be difficult to screen. This site offers no advantages over either Y_1 or Y_3, but offers enough space to accommodate a compressor station. The site can be moved east to achieve proper separation from the only house nearby.

Y_3 is the most westerly junction site along the preferred route and is situated immediately west of Cedar Road. The site is well screened from the road by the existing vegetation and because it slopes away from the road. The land is within the ALR, but is not cultivated at present, being covered with scrub. A dense stand of timber that would have to be crossed by the pipeline exists to the east of Cedar Road. The site is large enough to accommodate a compressor station and offers adequate separation from houses in the area. Some flexibility in site location exists, offering additional opportunities to meet noise level requirements.

For all three sites, the northern leg of the transmission pipeline would cross the Nanaimo River at the preferred crossing location. This crossing is located upstream of a major chum spawing area; chum do not utilize the crossing location for spawning but do migrate past it during both upstream and downstream migrations. The Department of Fisheries and

Oceans expressed the concern that construction activity could release fine sediments into the river, adversely affecting spawning areas downstream. The primary advantage of this crossing location from a technical perspective is that the approaches on both sides of the river are gently sloped, thereby simplifying construction and reducing the risk of siltation from dumped spoil.

Two other sites for the junction were examined. Both are located slightly farther north and would utilize a river crossing downstream of the preferred crossing site. Crossing the river at this location would require a fairly steep descent immediately west of the Cedar Lawn cemetery; in addition, as the river banks here are composed largely of silty sands, the potential for siltation was considered to be higher than at the preferred crossing site.

Site Y_4 is located northwest of the cemetery. Although the cemetery is being expanded at present on the west side, there appears to be sufficient space between the cemetery and the Harmac water mains to accommodate the southern leg of a transmission pipeline. The site itself is fairly exposed and would be visible from the cemetery and Cedar Road. It also would require extra length of the large diameter pipe as it is the farthest inland from the shore landing. Due to the restricted space off the floodplain, accommodation of a compressor station at Y_4 would be difficult.

Site Y_5 is situated immediately east of Cedar Road in the presently undeveloped portion of MacMillan Bloedel's tree nursery. This site offered no advantages over Y_4 and would be considerably more exposed to traffic on Cedar Road. Accommodation of a compressor station would require more land than a junction. There is a major subdivision to the northeast.

In conclusion, site Y_3 is preferred for these reasons:

(i) it can be readily screened from the road;
(ii) it is not in close proximity to existing residences;
(iii) it offers the most direct routings for the northern and southern legs of the transmission pipeline;
(iv) it provides the best access to the preferred crossing of the Nanaimo River; and
(v) it offers a suitable site for a future compressor station.

3.7.4 Route Options

The nominated route assumed a shore landing just south of Flewett Point, in the vicinity of Site A, and followed the section line between sections 8 and 9 to Yellow Point Road. Since that time, a review of the shore approaches was undertaken, as described in Section 3.7.1, and the preferred shore approach shifted southward to Site E. This, in turn, resulted in a review of land routing options between Site E and Cedar Junction (Y_3).

Map 3 shows the various route options that were considered between Site E and Cedar Junction. The route options are identified by letter on the map and will be referred to, henceforth, for route segment identification and comparison.

Sub-options EGF

Three sub-options were compared between Site E and node F, where the route intersects Greenway Road. The northern option would traverse northwest along the upper road in the new subdivision via Lots 7, 6, 2, and 1, returning to the nominated route near Ingram Road and following the section line inland to Greenway Road. This route would require crossing a marshy area south of Greenway Lake, and fairly extensive rock excavation between the lake and Greenway Road. The bedrock is very close to the surface in this area.

The most direct route would run inland through Lots 7, 15, and 14, heading northwesterly to join the nominated route just west of Greenway Road. This route has several advantages over the northern option in that it would avoid the rocky terrain encountered along the northern route east of Greenway Road, provide a better crossing of Greenway Road, and be less exposed to the risk of third-party damage inherent in the northern option that would run alongside the upper road through the new subdivision.

Also considered was a southern option that would run southwest towards De Courcy Road, then turn northwards to node G where it would join the direct route. This route is considerably longer than the other options and would require some rock excavation where it ascends an escarpment west of Pylades Road.

The preferred routing is favoured because of the shorter distance and somewhat lower costs and because it would require less rock excavation as compared to the other options. Furthermore, this route would incur less disruption of existing and potential residential subdivision than the other routes. Given that the Cedar, Cranberry - Bright Official Settlement Plan (Regional District of Nanaimo, 1981) has recommended that the area west of Pylades Road maintain its rural character, and that lot sizes be no smaller than 0.2 hectares, it is unlikely that a pipeline ROW along preferred route would significantly compromise the future subdivision potential of these lots.

Sub-options FHY_1 and FIY_1 and GHY_1

Proceeding inland towards Cedar Junction, two possible routes were considered between nodes F and Y_1. The nominated route would follow the section line between sections 8 and 9 west of Greenway Road (FHY_1). This is the most direct route and crosses relatively flat terrain as compared to a longer, alternate route farther

north, FIY_1. As there are no obvious benefits for using the longer route, the preferred route is FHY_1.

A third option further south was examined, it would diverge from the preferred route at G, run inland between sections 7 and 8 to Yellow Point Road; and turn northward following the road to node H. This route was considered to be unacceptable as it would cross developed property on the east side of, and presently accessed from, Yellow Point Road.

Sub-option Y_1 Y_3

The preferred route between node H and Y_3 has not changed significantly from the route nominated in the Corridor and Route Nomination report. The crossing of Yellow Point Road between H and Y_1 is in a favourable location; the route would cross agricultural fields, thereby minimizing tree clearing and disturbance to residences. There would be no significant construction difficulties encountered along this section of the route.

3.8 CEDAR JUNCTION TO LANGFORD TERMINUS

Several changes to the nominated route south of Cedar Junction have been made since the publication of the Corridor and Route Nomination report in December 1980. Many of these changes are fairly minor, and have come about as a result of further field work undertaken by Hydro and comments made by local and regional governments on the nominated route. In particular, a review of the crossing locations for several major rivers, such as the Chemainus, Cowichan and Koksilah Rivers, was undertaken following the Department of Fisheries and Oceans' comments on the nominated route. Their concern stemmed from the potential for siltation and the possible disturbance or loss of salmon spawning and rearing habitat that could result during construction of buried crossings along the nominated route.

It should be recognized that one of the primary factors in selecting a route for the pipeline was the choice of acceptable locations and construction "windows" for each of the river crossings. Furthermore, although aerial crossings were not ruled out entirely, Hydro had a strong initial preference for buried crossings as the construction costs and the risk of damage to the pipeline were generally much less than for aerial crossings. Since that time, other considerations in routing the pipeline on Vancouver Island have tended to outweigh the advantages of buried crossings to the extent that, in some locations, construction of aerial crossings is now an acceptable alternative. These considerations are detailed in the following pages.

The review of routing options south of Cedar Junction, and the analysis of route changes that led to the selection of the preferred route, is described in the following paragraphs. Maps 3 to 14 show the preferred route and alternative routes, including the nominated route where it differs from the preferred route, that were considered in this analysis.

3.8.1 Ladysmith - Map 3

The preferred route has not departed significantly from the nominated route between KMP 7 and 22 other than a minor realignment to facilitate crossing Bush Creek. The preferred route runs adjacent to the 138 kV ROW, crossing from one side to the other in several places.

3.8.2 Duncan - Map 4

Chemainus Options: From KMP 22 to 32, the nominated route and several alternates were reviewed in light of concerns expressed by the District Municipality of North Cowichan, the Cowichan Valley Regional District, the Department of Fisheries and Oceans, the Cowichan Valley Farmers' Institute, and the Agricultural Land Commission.

The staff of the Regional District and the Municipality of North Cowichan questioned the desirability of a route adjacent to the west side of Highway 1, rather than to the east, and the choice of crossing site on the Chemainus River.

The Department of Fisheries and Oceans stated a preference for an aerial crossing of the Chemainus River; either at the 138 kV crossing farther upstream, or using the highway bridge located a short distance downstream of the nominated route. Their concern over a buried crossing on the nominated route stems from the potential erosion of the steep north bank that could cause siltation of a major chum spawning area downstream.

After a comparison of the potential buried crossing sites on the Chemainus River, the nominated route, was rejected in favour of a new route option to the east of the nighway, utilizing a buried crossing immediately downstream of the highway bridge. This route offered favourable approaches to the river and accommodated some of the Regional District's concerns over possible conflicts with developed property along the nominated route southwest of Fuller Lake.

Hydro compared this option with a west option, adjacent to the 138 kV transmission line, that would require an aerial crossing of the river approximately 1 kilometre downstream of the transmission line. This comparison resulted in a preference for the west option, for reasons that follow.

- The west route would require about half of the forest clearing required for the east route.

- The west option, because it is farther removed from populated areas, would incur fewer potential land use constraints than the east option and would, therefore, result in much less disturbance to land owners during construction.

- At present, the majority of land east of the highway lies within the ALR and is zoned to maintain the rural character of the area (minimum lot sizes of 30 acres and 5 acres). In the longer term, however, it was considered that the location of a high pressure transmission pipeline across the frontage of developable land adjacent to the Island Highway would increase the potential risk of third-party damage to the pipe, and possibly create difficulty for development of property along the east side of the highway if access across the pipeline ROW was required.

Table 3-1 shows the cost differences between the east and west options. The west routing results in a cost saving of approximately $100,000 and would better accommodate many of the land use concerns, and those of the Department of Fisheries and Oceans, while still offering a technically viable route. It was selected, therefore, as the preferred route despite the aerial crossing.

TABLE 3-1 COMPARISON OF CHEMAINUS OPTIONS

	East	West
Total Length (m)	7,000	6,100
Forest Clearing (ha)	8.95	3.94
% Class III Location[2]	100%	8%
Additional Trunk Line (m) (15 mm Ø high pressure pipe for distribution to Chemainus)	-	3,800 m
Chemainus River Crossing	70 m - buried	123 m - aerial
Bored Highway Crossings	1	1 (crossing for 15 mm Ø trunk line)
Road Crossings	3	1
Incremental Costs		
Materials	-	(155,651)
Construction	-	96,122
Land Acquisition	-	(69,169)
Distribution - Trunk Line to Serve Chemainus		33,000
TOTAL ADDITIONAL COST		(95,698)

1. These options were compared using common node points shown on Map 4, assuming the east junction point near Westholme. The cost saving from a combined Chemainus west/Duncan west routing is reflected in Table 3-2.

2. Class III location is defined as a unit area within which there are more than 46 dwellings; a unit area being 1.6 km x 400 m.

Duncan Options: At the time that the Corridor and Route Nomination report was issued, the nominated route south of the Chemainus River ran to the east of Quamichan Lake and the community of Duncan, rejoining the 138 kV transmission line ROW east of Cobble Hill. The major reasons for nominating this route were that it offered the best site for a buried crossing of the Cowichan River and an acceptable site for a buried crossing of the Koksilah River.

After that report was published, the Department of Fisheries and Oceans requested that Hydro review the possibility of using aerial crossings on both rivers. They expressed concern over potential damage to a network of side channels, important for salmon spawning and rearing, that meander across the southern floodplain of the Cowichan. They also expressed concern over potential erosion problems that could arise during and after construction of a buried crossing in the lower reaches of the Koksilah, as the river is not constrained by dykes in this section.

In addition, Hydro met with the Advisory Planning Commission of the District Municipality of North Cowichan to discuss routing options around Duncan. Although Committee members did not express a clear preference for any of the route options discussed, they did indicate that as long as the final routing did not conflict with community development plans, and as long as the final routing minimized effects on existing and planned subdivisions, the Committee could support a route nominated by Hydro. Their specific suggestions as to where disruptions to subdivisions could be avoided were taken into account in revising the locations of the east and west options.

Hydro reviewed the two major route options around Duncan and, as a sub-option, a route to the west of the 138 kV transmission line that avoids the Cowichan Indian Reserve. After comparing the east and west options, Hydro selected the route west of Duncan that runs adjacent to the existing Hydro electrical transmission ROW. A new feature in this section is the use of a high pressure transmission lateral instead of a distribution trunk to serve the Crofton mill. This requires a separate ROW.

The advantages of the western route are, broadly, as follows:

1. The west option stays adjacent to the 138 kV transmission line; as a result, a portion of the existing ROW can be used for working space, thereby reducing the amount of disruption to private land in

some cases. In addition, there is road access along the electrical ROW, eliminating the need for any new access. The route east of Duncan would require acquisition of working space adjacent to the pipeline ROW and, in some areas, road access may have to be provided.

2. The west option crosses through land that is much less developed for rural residential or commercial purposes than that crossed by the east option. Consequently, there are fewer potential land use conflicts along the west route, fewer property owners to be inconvenienced, and less time required for the property negotiations, should this become a factor. Areas that are particularly congested on the eastern route are along the western slopes of Mt. Tzuhalem, east of Quamichan Lake, and southeast of the Cowichan Reserve, where the route crosses a golf course and is in close proximity to several properties along the highway.

3. The west option, particularly when examined in conjunction with the preferred route west of the Chemainus River, would not cross the Island Highway, other than the crossings for the trunk line to serve Chemainus and the transmission lateral. This would result in less disruption to local traffic during construction. The risk of third party damage to the pipeline would be less for the west option than the east: because it is in a more remote location and does not intersect or parallel as many major or secondary roads as the east route does.

4. The west option would, to some degree, accommodate the concerns of the Agricultural Land Commission. Although the presence of a pipeline ROW on farmland presents only minimal restrictions on agricultural activities, Hydro concurs that there would be less developed farmland encountered along the west option.

5. The amount of forest clearing along the east and west options is virtually the same (approximately 12 - 14 hectares). The west route has more rock excavation, but the east route has more soft ground with a high water table. There is no significant difference between the routes from a technical point of view, other than the type of river crossings.

6. The west option offers slightly more flexibility in route location should it not be possible to obtain a ROW across the Cowichan Indian Reserve. This is due to the fact that if the east option was chosen, there is no opportunity for relocating the pipeline between the western boundary of the Cowichan Reserve and the eastern limits of the City of Duncan. In contrast, a route option avoiding Reserve land altogether does exist to the west of the west option. The advantage of the west option, in this regard, is that the detailed planning and acquisition of ROW along the west option outside the Reserve can proceed while negotiations with the Cowichan Band continue without the concern that the work would be completely wasted if negotiations for a ROW across the Reserve were unsuccessful.

7. Finally, the west option, while incurring higher costs for construction of the distribution system to supply gas to the initial service area, is better located in the longer term to supply gas to residential, commercial, and industrial customers that will gradually become established to the west of Duncan in the Cowichan Valley. In particular, it is much closer to the industrial area being developed northwest of Duncan.

The west option would require aerial crossings of the Cowichan and Koksilah Rivers. While these are not as technically preferred as buried crossings, due to greater exposure to damage, aerial crossings of these rivers meet the stated preference of the Department of Fisheries and Oceans.

Table 3-2 summarizes the differences in the costs, technical issues, and distribution factors between the east and west options, and documents the additional costs associated with the "far-west" sub-option. The figures presented in this table have incorporated the extra cost saving associated with the Chemainus west option, and have assumed a combined Chemainus east/Duncan east as the base case.

TABLE 3-2 COMPARISON OF DUNCAN ROUTE OPTIONS

Factors	Option East	West	Far West
Total length (km)	35.4	32.0	35.7
Additional grade rock (cu.m)	-	750	750
Additional ditch rock (cu.m)	-	4,670	4,670
Additional forest clearing (ha)	-	1.7	0.8
% Class III location (1)	71%	44%	48%
Additional Trunk line (m) (to serve Duncan)	- (10 mm T.P.)	1,200 (15 mm T.P.)	3,700 (15 mm T.P.)
Additional 4" Transmission Lateral to Crofton Gate Stn. (m)	-	1,060	1,060
Cowichan River Crossing	75 m - buried	125 m - aerial	157 m - aerial
Koksilah River Crossing	25 m - buried	178 m - aerial	178 m - aerial
Minor River Crossings	2	4	4
Incremental Direct Costs ($1981) Over Base Case - East Route			
Materials - 30 mm T.P. line	-	(438,551)	(165,451)
Construction - 30 mm T.P. line	-	598,795	891,450
Land Acquisition - 30 mm T.P. line	-	(280,924)	(72,673)
15 mmH.P. Lateral to Crofton (2)	-	100,608	241,000
Distribution - Duncan (3)	-	219,000	359,900
TOTAL INCREMENTAL COST		198,928	1,254,226

(1) For Class III definition, see Table 3-1.
(2) Includes materials, construction and land costs.
(3) West option requires additional 1200 m and far west requires additional 3700 m 6" trunk main ($67,600 and $208,500 extra cost respectively). Both options also require upgrading of distribution delivery capability estimated to cost $151,400.

South of Glenora Creek, the western option would continue southeastward, adjacent to the 138 kV transmission line. The route departs slightly from the transmission line at the Koksilah River where an aerial crossing would be constructed upstream of the 138 kV line. This route departs from the "west of Duncan" alternate shown in the Corridor and Route Nomination report (nodes 112-115-118), to minimize alienation of productive forest lands southwest of the 138 kV transmission line.

At the junction of the eastern and western options (KMP 59.5), the western option would avoid the large limestone quarry just west of Cobble Hill.

3.8.3 Shawnigan Lake - Map 5

South of Cobble Hill, the preferred route follows the same alignment as the nominated route, running adjacent to the 138 kV transmission line to Spectacle Creek. The crossing of Spectacle Creek avoids Spectacle Lake Provincial Park.

3.8.4 Victoria - Map 6

South of Spectacle Creek, the preferred route continues to run adjacent to the 138 kV line until KMP 78 where it departs from the nominated route to more closely follow existing access roads and avoid densely forested areas. This change is in keeping with concerns expressed by the local staff of the Ministry of Forests and the Victoria Watershed District.

The preferred route continues southward, skirting the southwest corner of Goldstream Provincial Park. A buried crossing of the Goldstream River is proposed in this location. The Department of Fisheries and Oceans expressed concern that the banks at this location are steep and may be unstable and prone to erosion. Although salmon do not utilize the river at the crossing location, coho spawn about 0.5 kilometres downstream and could be adversely affected by siltation.

The crossing of the Goldstream River must be considered in conjunction with the crossing of Waugh Creek, as siltation in either would affect downstream spawning areas. Waugh Creek is already crossed by one buried water main, and another is proposed to be installed by the Greater Victoria Water District.

Hydro reviewed the use of aerial and buried crossings of the Goldstream River, and concluded that a buried crossing of the river could be achieved successfully at this site. Hydro has constructed across steep gullies in Surrey, and believes that the erosion problems at this site can be effectively controlled. Moreover, it does not make sense to invest in an expensive aerial crossing of Goldstream River on the one hand, and construct a buried crossing of Waugh Creek on the other hand, given that the potential for siltation of downstream spawning beds is roughly equal for both streams. Finally, a further advantage associated with a buried crossing of the Goldstream is that the flows can be regulated by the Greater Victoria Water District dam upstream of the crossing site, thereby permitting fluming.

However, given the concern expressed by Fisheries and Oceans, Hydro will undertake further study of slope stability at this crossing, if awarded an Energy Project Certificate.

Hydro met twice with the Capital Regional District Planning and Development Committee to discuss the project and to hear comment on the nominated routing into the proposed terminus at Langford. Three concerns were stated: on the location of the Langford Terminus; on the routing of the transmission pipeline in an area that is a designated townsite and where major housing is planned; and on the appearance of the Langford Terminus.

With reference to the first concern, apprehension was raised that the pipeline appeared to cross through the Can-West shopping centre to the terminus; Hydro responded that this was not the case, and that the terminus would be located west of the shopping centre site at Hydro's

electrical substation on Jacklin Road. The pipeline would not extend to the shopping centre site.

On the subject of the pipeline entering the proposed townsite, Hydro responded that while both the pipeline and the proposed housing would be located on the south side of the E&N railway, the pipeline would be partially within the existing 138 kV ROW and not in direct conflict with the planned housing development. Hydro also noted that, based on extensive Lower Mainland experience, pipeline ROW's and urban development were not mutually exclusive.

Hydro responded to the concern about the aesthetics of the Langford Terminus by agreeing to consult with District planning staff as the project proceeds to determine suitable landscaping of the terminus site.

3.9 CEDAR JUNCTION TO CAMPBELL RIVER

This section of the report describes the significant changes to the nominated route between Cedar Junction and the Campbell River terminus that have arisen since the Corridor and Route Nomination report was issued in December 1980.

The reader is referred to the attached series of maps, specifically Maps 3, and 7 to 14, that show both the preferred route and the nominated route where it differs from the preferred route.

3.9.1 Ladysmith - Map 3

From Cedar Junction (KMP 0.0) to KMP 7.0, the preferred route generally follows the nominated route. There are only minor changes in alignment. These changes take advantage of more suitable terrain, property boundaries, and a better crossing of the E&N Railway. The choice of location for crossing the Nanaimo River was discussed in Section 3.7.2.

Near KMP 5.7, the preferred route traverses a plateau, avoiding a steep descent of the escarpment that lies immediately north of the abandoned railway, then swings north along the railway to Extension. The preferred route crosses through a Ministry of Highway's gravel lease just east of the abandoned railway. Due to a large escarpment immediately to the north of the lease, it would be difficult to completely avoid this gravel lease. Minor adjustments in the preferred alignment, however, may be possible should the gravel reserve be further exploited.

3.9.2 Nanaimo - Map 7

The preferred route follows the railway from KMP 6.5 - 10.0 and does not depart from the nominated route.

In the Corridor and Route Nomination report, two alternate routes were considered between Extension and Westwood Lake: one that traverses a hill west of the Department of National Defence (DND) property; and one that crosses through the DND property and close to the Rifle Range. Due to the more favourable terrain and less valuable forest resources found along the route, the preferred route is the latter. A drafting error in the Corridor and Route Nomination report caused the western route to be shown as preferred.

The nominated route is followed north of Westwood Lake to Brannen Lake (KMP 17.5 - 25), except for some minor realignments.

3.9.3 Nanoose Bay - Map 8

Between Brannen Lake and Nanoose Bay (KMP 25 - 35), a major route adjustment is proposed to avoid conflict with a planned highway bypass route for the north end of Nanaimo, to avoid an area of congested land use, and to avoid difficult terrain conditions that exist along the nominated route adjacent to the 138 kV line. The preferred route now traverses the forested valley slopes of Heikla Brook and proceeds northward around the escarpment west of Lantzville. The route descends through a break in

the escarpment to join the 138 kV ROW north of Arbutus Grove Provincial Park, traversing forested slopes on the north facing side of the escarpment. The pipeline ROW may be partially visible where clearing is required on the descent of the escarpment.

A much longer alternate route was considered: it followed Flynnfall Creek to its headwaters near Round Lake and descended via Bonell Creek. This route was rejected due to its excessive length, the considerable amount of wetland that would be crossed at the height of land near Round Lake, the lack of a suitable crossing of Bonell Creek, and the fact that it offered no obvious advantages over the preferred route.

There is a minor downstream diversion from the 138 kV ROW at Bonnell Creek to take advantage of a better crossing of the creek and recent clearing and land alterations on the west bank of the creek.

From the Bonell Creek to Craig Creek, the preferred route follows the east side of the 138 kV ROW. The Department of Fisheries and Oceans expressed a preference for a crossing of Nanoose Creek (KMP 39.0), either on the west or east side of the transmission line, provided that a buffer strip of vegetation be left between the pipeline ROW and the creek. The reason for this is to protect the potential salmon spawning and rearing habitat that could be used as far upstream as the 138 kV crossing, once fish passage is provided at the falls downstream. Plans to upgrade the existing 138 kV ROW to a double circuit 230 kV line may require widening of the existing ROW. From the perspective of the transmission line planners, it would be preferable to expand this ROW on the west side; therefore, the pipeline would be located within or adjacent to the east side of the electrical ROW. A "leave strip" of some 20 metres can be ensured, though, between the pipeline ROW and the creek.

The decision to maintain the pipeline alignment adjacent to the 138 kV line between Nanoose Creek and the Englishman River was made to accommodate MacMillan Bloedel's concern that the nominated route to the east

would alienate prime timber areas which could be avoided with little inconvenience to the project or other resources in the area.

At Craig Creek, the preferred route swings east to achieve the preferred crossing site of the Englishman River. As the approaches to the crossing are gently sloped and erosion control on the banks is feasible, a buried crossing can be constructed with minimal environmental impact.

North of the Englishman River, the preferred route would return to the 138 kV ROW, thereby avoiding two highway crossings of the Parksville bypass and requiring a single, relatively simple, crossing of Highway 4 to Alberni.

3.9.4 Qualicum Beach - Map 9

North of the Englishman River, the preferred route has not departed significantly from the nominated route: if follows the northeast side of the 138 kV ROW to the Alberni junction. There are a few minor deviations from the nominated route where the route departs from the electrical ROW to avoid the electrical substation at Parksville and to reach a better crossing of the Little Qualicum River downstream of the 138 kV crossing.

3.9.5 Port Alberni - Map 10

Alberni Lateral: The Alberni junction has shifted approximately 1 kilometre north of that shown on the nominated route to reduce conflict with land that is being developed on the east side of the 138 kV ROW, in Blocks 31 and 41.

From the junction (KMP 0.0) to KMP 3.0, the preferred route runs in a southwesterly direction to the north end of Illusion Lake, skirting the boundary of a private gravel lease northeast of the lake, and largely avoiding a new subdivision currently being developed east of the lake.

The route follows the nominated route along the south side of Horne Lake to KMP 10.0, then diverges from it to a better route over the mountainous terrain west of Horne Lake, identified during ground surveys. That route minimizes the amount of rock blasting required but is slightly longer than the nominated route.

Two Alberni terminal sites were reviewed at the request of the Alberni-Clayoquot Regional District. The preferred site is located in Crown land east of Alberni; the alternate site is located near the electrical substation.

The alternate site was rejected as it would require a slightly longer route to reach it, may conflict with proposed expansion of the substation, and would cross a private gravel lease east of the town.

Qualicum River Crossing: The nominated route incorporated a buried crossing of the Qualicum River immediately upstream of the western boundary of the Indian Reserve and downstream of the hatchery facilities. This site was later considered to be unfavourable due to the presence of a very steep railway embankment north of the crossing that would have to be ascended, and the high potential for stream siltation in the lower reaches of the river. The Department of Fisheries and Oceans has also recommended an aerial crossing be used for this river.

Since that time, Hydro has reviewed several options for crossing the river - both buried and aerial crossings - and concluded that a buried crossing was most favourable in the location shown on Map 10. The reasons for this are as follows:

(1) the cost of an aerial crossing at the most suitable site is in the order of $700,000 more than a buried crossing in the preferred location;

(2) the crossing of the Qualicum is complicated by the presence of both the natural channels of the Qualicum River and Hunts Creek, and the spawning channel adjacent to the river. The conditions for construction a buried crossing are ideal in many respects, due to the fact that the flows on the Qualicum River and spawning channel can be controlled to a very large extent, thus facilitating construction of a buried crossing, and greatly reducing potential siltation problems;

(3) a meeting with Fisheries and Oceans personnel at the Qualicum site was held on 6 October 1982 where the various crossing options were presented and inspected in the field. This meeting resulted in a mutual agreement that a buried crossing at the preferred site was feasible, and was in the most suitable location.

Hydro concluded, therefore, that the preferred route, with buried crossings of all channels, offered the best solution to the problem, in terms of achieving an environmentally acceptable crossing with limited siltation potential, maintaining the aesthetic values of the hatchery site, no conflict with the hatchery operation, and within a reasonable cost.

Qualicum River to Thames Creek: The preferred route lies to the east of the nominated route in this section and assumes a common alignment with a proposed route, gazetted in 1950, for the Island Highway. The preferred route offers a better crossing of Nile Creek than does the nominated route. This route has the advantage that if the highway reserve was not utilized for highway purposes, then the pipeline could utilize this alignment.

This possibility was discussed with the Ministry of Transportation and Highways: the Ministry indicated a current preference for a new highway route that lies further inland as the gazetted reserve is inadequate for Ministry purposes. No conclusion regarding the availability of the unused gazetted ROW for the pipeline has been reached.

The crossing of Thames Creek is in an area of steep banks that are prone to erosion. Measures will be taken to ensure bank stabilization during and after construction.

3.9.6 Fanny Bay - Map 11

From Thames Creek to KMP 86, minor changes in alignment are proposed, primarily to take advantage of better terrain and approaches to stream crossings.

The Department of Fisheries and Oceans suggested that the crossings of McNaughton and Rosewall Creeks be located as close to the highway crossings as possible. The preferred route will be adjacent to the highway when it is widened to four lanes, as is planned at present.

Two gravel leases would be crossed by the preferred route immediately south and west of Rosewall Creek Park. Neither lease can be easily avoided by re-routing the pipeline; however, it is expected that this conflict can be minimized by carefully aligning the pipeline relative to the highway.

North of Rosewall Creek Park, the preferred route departs slightly from the nominated route and parallels the E&N Railway to take advantage of better crossings of three unnamed creeks (#25, 26, and 27) and Wilfred Creek.

The route also crosses Waterloo Creek in this section. Fisheries and Oceans commented that the crossing of Waterloo Creek may result in degradation of water quality and loss of fish rearing habitat as coho and chum are both found in the lower reaches of this creek. They suggested that a crossing upstream at the 138 kV line be examined. The resultant examination determined that, while a crossing of Waterloo Creek at the 138 kV line was feasible, it would make it impractical to use the preferred crossing sites on Wilfred Creek and unnamed creek #26. Buried crossings of these latter two creeks are not feasible at the 138 kV line.

The preferred route rejoins the 138 kV ROW north of Wilfred Creek and crosses Cowie Creek at the transmission line crossing. This departure from the nominated route will better accommodate the development of the Cougar Creek subdivision, located on the north bank of the creek farther downstream. This realignment would also minimize effects on fish rearing habitat.

The preferred route maintains a common alignment with the nominated route north of Fanny Bay and crosses the Tsable River upstream of the E&N Railway. Fisheries and Oceans expressed concern over possible sedimentation due to slope failure at the preferred crossing and suggested that better slope conditions existed closer to the highway. Hydro investigated this alternative but considered it to be unacceptable for two reasons: congested land use near the highway and the higher construction costs associated with two crossings of the E&N Railway tracks. Bank erosion at the preferred crossing site can be controlled effectively through proper construction techniques.

3.9.7 Courtenay - Map 12

The preferred route does not deviate significantly from the nominated route between KMP 98 - 122. The route runs adjacent to the east side of the 138 kV ROW to KMP 102 where it heads toward the coast to take advantage of better terrain conditions at the crossing of several unnamed creeks, Hart Creek, and the Trent River. Fisheries and Oceans expressed concern about possible erosion of the steep banks at the preferred crossing of the Trent River and recommended further investigation of a downstream crossing. This was done, and Hydro's further investigation revealed that other crossing sites west of the E&N Railway would be in conflict with a borrow pit area on the north bank, wet soil conditions above the south bank, and steep sided banks along the river. It was concluded, therefore, that the preferred crossing site is still the most suitable location for a buried crossing upstream of the railway.

The route runs inland after crossing the Trent River, and is adjacent to the west side of the 138 kV ROW as it passes west of Courtenay. Possible changes in the existing transmission line arrangements, proximity of buildings to the 138 kV ROW, and possible highway development make this an area where final routing cannot be decided until further planning and field surveys. As a result, the final routing may vary from that shown.

The preferred route swings eastward from the 138 kV ROW at the approach to the Puntledge River. The banks on the north side are steep and the crossing is in an area of shale that would require some blasting in the river bed. Fisheries and Oceans expressed concern over the effects on spawning and rearing salmon that could result from sedimentation due to bank erosion and blasting, particularly as it may affect the hatchery intake located downstream of the crossing site. They expressed a strong preference for an aerial crossing at this location.

Hydro reviewed the crossing situation, and concluded the following:

1. The effect on water quality resulting from blasting in the channel would be minimal, as little disturbance of silt would occur. The major problem in terms of siltation, however, is the steep bank on the north side of the river which consists of highly erodable material. Use of erosion mats and filter blankets would reduce siltation effects.
2. The adverse effects on the quality of the hatchery water supply can be completely avoided by utilizing water from Hydro's penstock during construction. (This was done previously.)
3. Construction (i.e. blasting) can be scheduled to avoid impacts on migrating salmon.
4. An aerial crossing in this location would be extremely unsightly, as it would involve a lengthy span across the entire floodplain of the river.
5. As the crossing is in rock, little sedimentation would occur once the pipeline is installed in the channel.

6. Furthermore, although a crossing upstream of the 138 kV line is feasible, it would require crossing the Browns River; the preferred crossing is situated downstream of the confluence of the Puntledge and Browns rivers and would, therefore, only involve a single crossing of the Puntledge. A crossing at the 138 kV ROW is not desirable as it would require crossing the entire floodplain at the confluence point of the Browns and Puntledge Rivers.

However, B. C. Hydro realizes that mutual agreement has not yet been reached on arrangements for crossing the Puntledge and, if awarded a certificate, will undertake further study of this crossing.

3.9.8 Tsolum River - Map 13

After crossing the Puntledge River, the preferred route swings toward the coast and rejoins the nominated route at the crossing of the Tsolum River (KMP 127.8). Other than a minor realignment at the crossing of Merville Road, and a minor realignment just north of Black Creek to avoid a wetland area, the preferred route does not depart from the nominated route.

The area between Black Creek and the Oyster River is characterized by numerous wetlands, some of which are important for fish and waterfowl. The Canadian Wildlife Service recommended that these wetlands be avoided wherever possible; the Department of Fisheries and Oceans expressed concern about crossing the wetlands that may support juvenile coho. Hydro undertook a preliminary ground survey of the route in this area; it resulted in a preferred route that avoids wetlands except for a short distance at the Black Creek crossing in the Oyster River floodplain.

3.9.9 Campbell River - Map 14

North of the Oyster River, the preferred route shifts eastward from the nominated route and avoids a major wetland area just west of Oyster Bay (KMP 155). The route avoids a gravel lease located at KMP 150. Minor

areas of wetlands are encountered east of Campbell River airport near KMP 160. The route proceeds northerly to the Campbell River terminus at the southeast corner of the Quinsam Indian Reserve and closely follows the alignment of the nominated route.

3.10 MERVILLE JUNCTION TO POWELL RIVER

The lateral to Powell River (see Map 15) starts at a junction near KMP 130. The route runs easterly to the proposed site, near Little River, for the shore approach of the marine crossing to Powell River. Because of the pattern of waterfront development and the submarine conditions in the area, there are few suitable opportunities for a shore approach. The location shown on map 15 is the most favourable.

Two routes for the underwater crossing to Powell River were surveyed and the one shown on map 15 has the more favourable bottom conditions and is technically feasible. Further survey work will be required to define the optimum route.

While detailed environmental work has yet to be done, it is likely that the shorelines at either end of the crossing, where the major environmental interest occurs, are not unusual or exceptional, relative to adjacent shores.

The landing on the east side has been located to avoid Scuttle Bay, a focus of interest and settlement on the Sliammon Reserve.

The route from the landing to Powell River has provisionally been located across the Sliammon Reserve, pending discussions with the Band Council. The route passes the proposed site for the fertilizer plant, in DL 450, and crosses Powell Lake at the narrows upstream of the dam, via an aerial crossing. The terminus is at a point midway between the mill and Westview, well located to serve the distribution system for the community.

3.11 CONCLUSIONS

The response to the Corridor and Route Nomination report from the public, local and regional governments, and provincial and federal agencies has proved to be valuable in refining the route for the proposed Vancouver Island natural gas pipeline.

Hydro has met and corresponded with many interested persons concerned with route location and has tried to incorporate their suggestions or concerns in the selection of the preferred route.

Concurrent with the public review process that began in March 1981, further technical work, including a substantial amount of field work, has been done. The findings of this additional work are reflected in the preferred route, described in this report.

Hydro is committed to further public review of the proposed routing to and on Vancouver Island, and to Powell River, during and after any hearing process, and continues to invite comment from the public, and all levels of government, on the preferred routing for the gas pipeline.

APPENDIX 1

SUMMARY OF MAJOR COMMENTS
RECEIVED DURING ROUTE
CONSULTATION AND B. C. HYDRO'S RESPONSE

APPENDIX 1

SUMMARY OF MAJOR COMMENTS RECEIVED DURING ROUTE CONSULTATION AND B. C. HYDRO'S RESPONSE

The Ministry of Energy, Mines & Petroleum Resources is responsible for administering the Guidelines for Linear Development as they apply to energy projects, and for coordinating the responses of provincial government agencies to any study prepared by an energy project proponent.

B. C. Hydro recognizes that the responses from the various agencies have not been synthesized into a coordinated response reflecting the policy and judgement of the government as a whole. As a result, some of the comments and requirements stated by the different agencies are in conflict.

The complete list of the individual comments received from Provincial government agencies is attached as Appendix 3. A summary of those comments pertaining to route location, prepared by the Assessment Branch of the Ministry of Environment, follows, together with Hydro's response to those comments, (in smaller type).

The comments of the following agencies and groups are discussed in the following pages:

1. Fish and Wildlife Branch (Lower Mainland)
2. Waste Management Branch (Lower Mainland)
3. Water Management Branch (Lower Mainland)
4. Fish and Wildlife Branch (Vancouver Island)
5. Water Management Branch (Vancouver Island)
6. Air Studies Branch (Victoria)
7. Terrestrial Studies Branch (Victoria)
8. Assessment Branch (Victoria)

9. Ministry of Lands, Parks and Housing (Vancouver Island)
10. Lands, Parks, and Housing (Lower Mainland)
11. Lands, Parks, and Housing (Victoria)
12. Minsitry of Agriculture and Food Ind. Resources Branch (Victoria)
13. Ministry of Provincial Secretary and Government Services; Heritage Conservation Branch
14. Ministry of Transportation and Highways, Engineering Branch
15. Ministry of Forests, Strategic Studies Branch (Victoria)
16. B. C. Agricultural Land Commission
17. The Islands Trust
18. B. C. Harbours Board
19. B. C. Hydro
20. Regional Districts
21. Municipalities
22. Indian Bands
23. Group Interests
24. General Public

1. Ministry of Environment
Lower Mainland Region:

1. Fish and Wildlife Branch

(a) The report appears generally to meet the Stage 1 requirements of the "Linear Guidelines."

Acknowledgement noted, however it would have been more useful if there was a statement as to whether or not there was agreement with the conclusions of the report in the definition of the preferred corridor and route.

(b) The proponent should recognize Roberts Bank environmental sensitivity because of its importance to waterfowl, shorebirds, fish and other biological resources. Further, no consideration appears to have been made of specific Crown reserves for fish and wildlife management in the Roberts Bank Area.

The importance of Roberts Bank is recognized through OIC 908. A separate impact assessment report has been prepared for this area.

(c) More emphasis should be placed on preserving marsh, with a recommendation that the shore assembly be located inside the dyke east of Brunswick Point.

The issue of marsh restoration was addressed in detail in the OIC 908 report. The shore assembly is inside the dyke.

2. Waste Management Branch

(a) Between nodes 1 and 2 in Delta a gravel road bed contains phenol manufacturing waste tars (extension of 60th Avenue past 68th Street). Precautions should be taken to avoid disruption of this road which could result in some hazard. If the alternate route in this area is chosen, the proponent should avoid disruption of the leachate collection facilities for the Burns Bog refuse site. Hog fuel or similar construction materials should not be used near Arthur Slough or other creeks, to avoid leachate problems.

The advice concerning the phenol is appreciated. The road crossing will be appropriately handled. B. C. Hydro prefers to keep away from the refuse site in Burns Bog. The final route analysis in this area is discussed in Section 3.2. Any hog fuel used for construction in wet areas will be removed immediately upon completion of construction.

3. Water Management Branch

(a) No concerns or comments.

Noted.

Vancouver Island Region:

4. Fish and Wildlife Branch

(a) The report contains information on non-mitigatable impacts, but does not include discussion of those which are mitigatable and what mitigation measures are proposed.

The philosophy of B. C. Hydro in route selection has been to avoid serious adverse impacts through careful routing; this should be recognized as the most effective mitigative measure.

Most of the other significant mitigative impacts occur on Roberts Bank and are discussed in the OIC 908 report.

(b) Some stream crossings are planned in areas where the water is quite deep. If plans exist to tunnel under highways perhaps this mode of crossing construction should also be considered in stream areas where impacts are likely.

B. C. Hydro considered that it is possible to construct buried river crossings at the sites selected during the agreed 'construction window' with acceptable levels of impact. The boring technique is used under highways because of the impracticality of stopping traffic. No 'construction window' exists for highway traffic.

(c) This Branch has requested a copy of the aquatic studies report prepared in 1980 by Howard Paish & Associates Ltd. before it can provide a detailed review of stream crossing plans. B. C. Hydro is providing the necessary reports to the Branch. Therefore, more detailed comments are expected in the future.

These reports have been made available.

5. Water Management Branch

(a) Most water management concerns are associated with stream crossings:

(i) Domestic water licences and supplies and associated impacts should be addressed in addition to fisheries concerns.

(ii) Stream crossings will require approvals under the Water Act; this would require for each stream an inventory of water licences and applications, criteria used to decide on crossing location, stream scour depth estimates and methodology for determining them, bank protection designs, and one-in-five-year flow estimates. In addition, the applications should be accompanied by the 1974 Howard Paish and Associates report and the 1978 and 1979 Northwest Hydraulic Consultants reports. Compensation and mitigation issues associated with existing water licences must also be addressed.

B. C. Hydro recognizes the existence and rights of water licence holders. As their interest is very similar to that of fisheries, namely the preservation of water quality and prevention of siltation, and as the aquatic ecosystem cannot be completely protected from siltation, the selection of crossing site location was based largely on the degree to which siltation could be avoided.

B. C. Hydro considers that matters dealing with water licences are appropriate at the Stage 2 level of the "Linear Guidelines". However, B. C. Hydro's position with regard to water licence holders is that Hydro will conform to the requirements of the Water Act and will provide such information as is necessary to the Water Management Branch to obtain approval at each river and stream crossing. The Water Management Branch is in possesion of all records on water licences on each stream. B. C.

Hydro is uncertain as to why it should be necessary to duplicate this material for a river crossing application, when the Branch already has the information in its own files.

B. C. Hydro will advise all water licence holders downstream of each river crossing of the construction program, and, if there is a chance of affecting industrial production, such as at a pulp mill or a food processing plant, appropriate measures will be taken, as agreed to by the licencee.

Victoria Region:

6. Air Studies Branch

(a) Adequate stack height should be provided for discharge of NO_x gases, especially if water injection is not used to reduce the emission level.

Noted; this comment is not relevant to route location.

(b) Measures should be implemented to control evaporation of hydrocarbon gases from the storage tanks.

Noted; this comment is not relevant to route location.

7. Terrestrial Studies Branch

(a) More recent detailed soil and agriculture capability data for Shawnigan Lake and Nanaimo areas is available than the Resource Analysis Branch data used in the proponent's report, and should be considered by the proponent.

B. C. Hydro's position is that there is no long term impact on agriculture from pipeline construction in farmland, and that for the Vancouver Island region, it is preferable to route the pipeline through farmland than through productive forest land. Detailed information on agricultural capability is, therefore, not relevant to route location except where there is a choice to route through high capability land or low capability land, in which case the latter would be done. The data mentioned will be studied and used where appropriate.

(b) All terrain maps provided in the reports are accompanied by insufficient base data and methodology to allow them to be adequately assessed.

B. C. Hydro strongly disagrees with the comment. The terrain maps in the Atlas are referenced, and are more than adequate to fulfill their purpose, which is the selection of a preferred pipeline route.

(c) Each map should contain a written description of:

(i) general area terrain (materials and processes)

(ii) constraints and problems.

B. C. Hydro disagrees. The purpose of the terrain maps is to assist in selection of a corridor or route. Only that material relevant to that purpose needs to be shown, and it is. Problems that may affect the choice of a route are identified on the 1:50,000 scale maps.

8. Assessment Branch, Victoria

Generally, the report meets the Stage I requirements. There are, however, a number of deficiencies, the major ones being outlined below:

The acknowledgement is noted, but again, it would have been more useful if there had been some indication as to whether or not the nominated corridor and route met with broad approval of the Branch.

(a) More information is required for recreation, visual, heritage, and aquatic resources.

B. C. Hydro does not agree that further infromation on recreation, visual, heritage and aquatic resources is necessary to permit selection of a preferred corridor and route.

(b) Further study and consideration of the West Malahat route is warranted due to potential wildlife, recreation, and property conflicts in the East route area.

It is not understood why the West Malahat route should receive further study on wildlife issues when in (f) it is recognized by government that the West route would have more impact on deer, the key indicator species the area, than use of the East Malahat.

B. C. Hydro does not accept that use of the East Malahat route would have significant impact on recreation. It is not clear what is meant by property conflicts'; B. C. Hydro knows of no potential disagreements with landowners on the East Malahat route that are more severe than those with private landowners elsewhere on the Island.

(c) Attempts should be made to avoid tidal marsh areas (e.g. Fraser Delta) as well as high visual resource and natural hazard areas (e.g. Horne Lake shoreline).

The impact on the Fraser Delta marshes has been minimized as described in the OIC 908 report.

Construction through the Horne Lake valley will create some visual impact but it is argued that the impact will be less than use of a route through Cameron Lake valley. B. C. Hydro recognizes the existence of natural hazards in the Horne Lake area and the route is designed to minimize exposure to them.

(d) Construction activities should be scheduled to avoid seasons when wildlife populations are staging, nesting, or wintering.

The statement is too general to be useful. B. C. Hydro recognizes that there are site specific areas where construction timing should be controlled but cannot accept a blanket recommendation such as that made.

(e) Selection of the East Malahat route will result in less deer habitat loss than choice of the west route.

Agreed.

(f) Consideration should be given to impacts of blasting on water quantity obtained from rock fracture wells (East Malahat, Gulf Island).

These potential impacts were considered, and were one of the disadvantages of a route over Gabriola, Galiano, or Saltspring Islands. No wells exist on Valdes Island near the route.

The issue is of importance at the landing site on Vancouver Island where heavy blasting will occur, and possibly on the East Malahat route depending on final route selection.

(g) Because of recreational fishery importance, streams in the area should be researched for fish productivity, angler use, and potential mitigation procedures.

B. C. Hydro recognizes the importance of the recreatonal fishery. Its whole emphasis on river crossing design is to protect the aquatic system by preventing siltation, the work suggested would not help in location of a better crossing site.

(h) Since NO_x emissions from compressors are expected to exceed allowable limits, appropriate treatment methods should be employed.

Compressor station emissions will be dealt with through the regulatory process.

9. Ministry of Lands, Parks and Housing - Vancouver Island Region

(a) The proponent failed to explain plans to minimize foreshore disruption with reference to existing and future recreational and asthetic values.

B. C. Hydro explained in the report, in general terms, the nature of the construction work on the foreshore at any landing. The site specific details at each site will be described at the approval stage if B. C. Hydro's application is accepted.

(b) With reference to blasting impacts, the proponent has failed to describe the expected severity, what mitigation is proposed, and where waste rock and dredge soil will be disposed of.

The blasting at the landing on the east side of Valdes will be severe, at the landings on the west side of Valdes and at Flewett Point it will be moderate. B. C. Hydro will present detailed plans for construction of the landings at the time approvals are sought, together with its proposals for mitigation of impacts and waste rock disposal.

10. Lands, Parks, and Housing, Lower Mainland Region

(a) Use of the southern route is endorsed but concern is expressed over land use in Delta. The benefit of use of this area for the pipeline should be studied relative to other potential uses such as recreation and agriculture.

The endorsement of the southern route is appreciated. The analysis of route selection through Delta is addressed in Section 3.2. It is believed that this covers the concern expressed.

(b) Public involvement should be reported.

Public involvement could not start until the Corridor & Route Nomination Report was released. Public concerns and suggestions are summarized in this report.

(c) No description was made of extensive spur lines to Howe Sound and the Sunshine Coast, which would be major concerns. Are these to be later phases of this proposal or entirely new expansion proposals?

The transmission pipeline to Squamish, Howe Sound and Sechelt is not part of the Vancouver Island Project. It was mentioned in the report to allow a thorough comparison between the northern and southern routes. If B. C. Hydro is successful in its application to transmit and distribute gas on Vancouver Island, these lines could be the subject of possible future applications.

11. Lands, Parks and Housing, Victoria

(a) No apparent concrete reason was given to explain why only two major route options were considered feasible.

Knowledge of the terrain provides the answer. Only those two routes identified were discussed at the Public Utility Commission hearings in 1972, or adopted in any subsequent pipeline proposals.

The only other route that might be within the bounds of feasibility would be from Williams Lake to Tatlayoko Lake, down the Homathko Valley to the head of Bute Inlet, along the inlet to Johnstone Strait and then over a series of islands to Campbell River. This route is much less attractive on all grounds than either of the others.

(b) The issue of intertidal zone revegetation should be addressed.

The only potential disturbance of intertidal vegetation occurs at Brunswick Point. The revegetation of this is discussed in the OIC 908 Environmental Impact Assessment report.

(c) The shore assembly should be constructed within the Brunswick Point dyke.

The shore assembly will be inside the dyke.

(d) If possible, Valdes Island construction should be scheduled to avoid eagle nesting time.

Agreed.

(e) Procedures to detect underwater pipeline leaks should be described.

The detection of underwater pipeline leaks is not relevant to routing. Large leaks will be detected by loss of pressure and evidence of escaping gas. Detection of small leaks will depend on inspection by divers and remotely controlled cameras or sonic devices.

(f) Staff and construction personnel should be aware of the herbicide ban on the Gulf Islands, and in conjunction with aquifers.

The restrictions on use of herbicides will be incorporated in contract documents and maintenance prescriptions.

12. Ministry of Agriculture and Food and Resources Branch, Victoria

(a) The southern Mainland route is not favoured because of agriculture dominating activities on lands which are highly capable for agricultural purposes. In several cases the authors underestimate agricultural capability potentially gained through proper water mangement. To avoid loss of productive lands and construction impacts on drainage and soil texture, the northern route is recommended.

When viewed from the narrow viewpoint of the Ministry of Agriculture & Food the northern route may be preferrable because there is no disturbance to agriculture on the mainland of B. C.

Clearly, selection of a route has to balance the credits and debits of each route and the northern route obviously has a significant permanent impact, by reducing the productive forest land base, while the southern route has only a temporary impact on agriculture assuming that trench restoration is achieved as intended. In B. C. Hydro's view, the southern route is clearly preferred, when examined from a broader perspective than that of the Ministry.

(b) On Vancouver Island, the same corridor preferred by the Agricultural Land Commission is recommended, along with the following additional mitigative measures:

(i) Compressor stations should be located away from livestock operations and productive land.

(ii) Possibilities should be identified to avoid buildings and cash crops.

(iii) Where possible the route should follow existing corridors or property boundaries.

There will be no compressor stations on Vancouver Island. Farm buildings will be avoided in route location. Compensation will be paid for any crop losses. B. C. Hydro agrees that it is preferable to follow existing rights-of-way and property boundaries, but the ability to do this is controlled by the terrain, and a variety of resource uses in addition to human settlement.

(c) The Ministry wishes the proponent to maintain contact with district staff during surveying and final route selection to ensure minimization of agricultural impacts.

B. C. Hydro will maintain contact with Ministry representatives as the planning and construction process proceeds.

(d) Further requirements should be:

(i) Work scheduling to avoid soil compaction.

(ii) Drainage control measures to avoid erosion.

(iii) Provision of animal and farm implement crossings for construction areas.

(iv) Statements on how terrain hazard and trenching impacts are to be mitigated.

Work can only take place in summer. This will minimize soil compaction. The ROW will be graded and ditched to control erosion where necessary. Provision will be made for crossings of working area where necessary to accommodate farmers' activities. Terrain hazard will be minimized through further detailed alignment studies. Trenching impacts will be reduced through proper restoration of drainage and soil sequence.

13. Ministry of Provincial Secretary and Government Services, Heritage Conservation Branch, Victoria

(a) This branch is in full agreement with recommendations outlined in the consultant report concerning heritage resources.

Agreement concerning heritage resources is noted.

14. Ministry of Transportation and Highways, Engineering Branch, Burnaby

(a) This branch will be responsible for ensuring that CSA Standard 2184-M1979, as well as standards in the Pipeline Act and Pipeline Regulations are followed if this project is implemented.

Noted.

(b) The pipeline should be installed far enough from the Roberts Bank railway to avoid damage if train derailments occur.

B. C. Hydro agrees with this recommendation and has revised the routing to give a minimum separtion of 50 m.

(c) Reports fail to confirm that negative pipeline bouyancy will sufficiently counteract underwater currents which might cause transverse movement.

This is a technical matter, not relevant to route location, and will be covered in the detailed design drawings to be submitted for approval.

(d) Methods of inspecting underwater portions of the pipeline should be outlined.

Underwater pipelines will be inspected by divers, and manned and unmanned submersibles, depending on the location of pipe, and nature of inspection.

(e) Equipment and associated procedures to be used and time required in repairing damage portions of underwater pipeline should also be described.

These will be described in technical material when submitted for approval.

(f) The operation pressure of the distribution pipes less than 6" in diameter (planned to be plastic) is not stated.

The maximum operating pressure will be 420 kPa (67 psi).

15. Ministry of Forests Strategic Studies Branch, Victoria

(a) It is preferable that the route, where possible be linked with corridors used for other developments to avoid loss of productive forest land.

Statement is confusing in that if route is adjacent to, rather than within, the existing 138 kV ROW there would often be a loss of forest land. It is, therefore, preferable for the route to be in agricultural land to minimize loss of the forest land base.

16. B. C. Agricutural Land Commission

The position of the Commission with respect routing and conditions for design and construction is as follows:

1. In regards to the corridor, the Commission is in agreement with the preferred corridor as outlined in the study for the Tilbury Island - Canoe Pass section, the Canoe Pass - Cedar Junction section, Cedar Junction - Campbell River section, and the Alberni Lateral.

However, for the corridor from Cedar Junction to Esquimalt, the Commission prefers corridor CFGHIKLMO/Esq. as this corridor would minimize the impact on agriculture in the area. As such, this is the only corridor the Commission would consider approving.

The Commission has provided the most detailed review of the nominated corridor and route received to date, and this effort is greatly appreciated. The Commission's agreement with the preferred corridor, is particularly useful. The Commission's preference for a corridor west, rather than east Duncan, has been reviewed by Hydro, and the preferred route, for reasons explained in Section 3.8, now runs adjacent to the 138 kV line, west of Duncan.

Mainland to Vancouver Island: nodes 1, 2, 3, 4, 5, 7, 8

The routing through Delta has been modified, largely to reflect the wishes of local farmers, and the Municipality of Delta.

Cedar Junction to Campbell River: nodes 8, 9, 12, 200, 203, 204, 205, 206, 207, 208, 209, 210, 212, 213, 214, 215, 216, 217, 218, 219, 220, 222, 224, 226

The route described differs from that favoured by B. C. Hydro in the following sections:

207-212 The inland route preferred by the Commission uses a crossing site on the Big Qualicum River that is unacceptable to the Department of Fisheries and Oceans, who are concerned about maintaining the water quality in the spawning channels downstream; B. C. Hydro rejected this crossing location because of the extreme difficulty in constructing a pipeline down the sides of the Qualicum River trench as the difficult saturated Quadra sands are exposed in the trench, this presenting extreme risk of erosion.

220-226 The inland route preferred by the Commission takes the pipeline away from the population between Courtenay and Campbell River making it improbable that service to the farming community would be economic. In addition, the route between node 222 and 224 would cross several areas of sensitive wetland habitat, of concern to the Canadian Wildlife Service and Department of Fisheries and Oceans. The coastal route therefore, is still preferred by B. C. Hydro.

Cedar Junction to Esquimalt: nodes 8, 9, 10, 100, 102, 105, 106, 110, 112, 115, 118, 119

It should be noted that these approvals are only preliminary, and that final approval will not be forthcoming until the Commission has had an opportunity to review the final right-of -way proposal.

The route by the commission diverges from that nominated by B. C. Hydro in the following parts:

102-105 The Commission favours a route along the 138 kV ROW, west of Chemainus. This has been adopted by B. C. Hydro.

106-108 The Commission favours the route west of Duncan, this has been adopted by B. C. Hydro.

Finally B. C. Hydro recognizes that the final responsibility for route selection under the "Energy Project Review Process" rests with the Cabinet.

3. Listed below are some additional conditions which the Commission may attach to its final approval. These are being provided now so that they may be incorporated into the Planning process.

- Applicant to store topsoil separately during trenching so it can be replaced on the surface during backfill.

  Agreed; standard B. C. Hydro specifications.

- Applicant to replace and/or repair all drain systems that are disrupted.

  Agreed; standard B. C. Hydro specification.

- Applicant to bury the pipe at a sufficient depth to ensure that there is no hinderance to any cultivation activity including deep ploughing and subsoiling.

  Agreed; standard B. C. Hydro specification.

- Applicant to ensure that the existing natural drainage pattern is not adversely affected.

Agreed; standard B. C. Hydro specification.

- Applicant to provide appropriate surface and subsurface drainage during the construction period.

The intent of this requirement is unclear, but it is agreed that surface drainage on fields should not be impaired by spoil heaps, and that water levels in the trench should rise no higher than normal level.

- Applicant to ensure that construction activity is contained within the right-of-way and designated work space.

Agreed; standard B. C. Hydro specification.

- Applicant to minimize impact on surrounding land by using dust control, strict rules on trespass, noise abatement, compensation where necessary, interim drainage and irrigation systems to avoid interruptions, and other methods deemed necessary.

Hydro will endeavor to minimize impact on surrounding farmland. Compensation will be paid where adjacent land and crops are adversely affected by construction activity. Hydro reserves the right to negotiate with landowners as to the specific nature of any compensation agreement. Noise will be controlled as per WCB regulations.

- Applicant to ensure that the subsoil materials excavated during trenching do not contaminate the soils of the storage area.

Where it can be determined that stockpiling of trenched material on top of topsoil has contaminated that topsoil (e.g. saline material), Hydro will compensate for all remedial treatment necessary to restore soil.

- Applicant to grade and deep plough the right-of-way if appropriate.

The ROW will always be graded. It will be deep-ploughed where necessary to restore soil.

- Applicant to replace any existing irrigation and drainage system which is disturbed during construction and applicant to ensure that future irrigation and drainage works can be installed over the pipeline.

Agreed.

- Right-of-way to be restored to its original capability or better.

The soil along the ROW will be cultivated, fertilized and seeded, as required to restore productivity.

- Applicant to remove excess subsoil resulting from construction.

Agreed.

- Tile drains that are cut during the trenching operation are to be suitably plugged to prevent debris and silt from blocking the drainage system.

Temporary porous plugs will be inserted in cut drains to prevent clogging of drains at a later time.

- All open drainage ditches should be repaired and reseeded properly using appropriate soil stabilization processes.

Ditches will be restored after pipeline construction, using turf, rip-rap, sandbags etc. to prevent erosion of ditches.

- Applicant to dispose of excess excavated materials, stones, construction debris, trees, tree stumps and brush in a manner compatible with existing land use.

  Agreed; disposal areas will be specified at time of approval requests, and will conform to existing land use.

- Final reclamation should include reseeding of appropriate areas.

  Agree in general, but Hydro reserves the right to negotiate with landowner as to how the land should be reseeded, an the manner in which the farmer wants the land left.

- Applicant to control weed growth during construction and to ensure reseeded areas are weed free after reclamation.

  Hydro will control weeds along any portion of ROW for which Hydro was responsible for reseeding, and during construction.

- Applicant to locate stand pipes at fence lines and not in cultivated fields.

  Agreed, this is standard practice.

- Applicant to locate gate stations or other structures on lands outside of the Agricultural Land Reserve.

  This places an unrealistic restraint on the choice of location of gate stations as many communities are surrounded by ALR land, and pipeline routing to and from gate stations.

- Applicant to give reasonable notice of scheduling of the movement of materials, construction and normal maintenance and repairs to landowner and occupant.

Hydro land representatives undertake this during the course of their work.

- Applicant to schedule and select construction equipment and techniques so as to minimize soil compaction. Work should take place when the soil water content is below the plastic limit.

It is Hydro's intent to schedule pipeline construction on land for the period May - October which will usually ensure that work occurs when soil water content is below plastic limit, except in a year with a wet spring. Construction equipment available for pipeline construction is virtually standard; B. C. Hydro does not intend to call for special equipment on farmland and anticipates tracked excavators and tractors being used.

- Applicant to ensure that no topsoil is mixed with subsoil and/or eliminate compaction that may occur during construction.

It is agreed that topsoil will be stored separately from subsoil and that the two will not be mixed. Deep ploughing will be done to counteract soil compaction where necessary.

- Applicant to conduct no work during excessively wet soil conditions (wet weather and snowmelt).

Work is scheduled to occur during the dry summer period. B. C. Hydro recognizes that wet periods can occur during summer but considers that the decision on whether or not to work in a given situation should depend on the contractor, the site and the type of equipment available.

- No storage of fuels and fuel dumping in the Agricultural Land Reserve.

It is agreed that there should be no dumping of fuel on Agricultural Reserve Lands, but restriction on fuel storage is considered to be unnecessarily

restrictive in view of the fact that the Reserve often covers large areas, and many farmers have considerable fuel stored on their premises.

- Applicant to use existing access roads wherever possible.

Agreed.

- No gravelling of access roads in cultivated areas and removal of any temporary base, such as hog fuel, after use.

Agreed.

- Applicant to select access routes, in consultation with land owner.

Agreed, this is standard Hydro practice.

- Where requested by the landowner, applicant to provide access across the pipeline right-of-way during all phases of construction for all normal movements of farm equipment or animals.

Agreed in principle, but Hydro reserves the right to pay landowner compensation for disruption of farming activity, if this costs less than the cost of providing alternate access for farmer.

- Applicant to schedule construction on Agricultural Land Reserve lands in order to minimize the disruption of agricultural operations and lands.

B. C. Hydro agrees that construction should take place on farmlands when the soil moisture content is low, i.e. during the summer; however, this is also the time when crops are grown. This requirement is in direct conflict with the Commission's requirement that construction occur at a time when soil compaction would be miminized. B. C. Hydro will endeavour,

through location of the ROW and access roads, to miminize disruption of farming activity or growing crops.

- Applicant to compensate for the loss of any crop, any future production, and for the disruption of a farming operation.

This is Hydro's standard policy for right-of-way agreement through farmland.

- Compensation for damage to the soil and crops resulting from leakage or breaks should be agreed upon prior to construction.

Leakage of gas will not damage crops unless there was a fire. Hydro will compensate for any loss due to fire, but believes that the amount and manner of compensation await such an event.

Although the foregoing is a fairly exhaustive list of conditions on which the Commission could be making part of its approval, it should be noted that more specific mitigation factors could be outlined once a final right-of-way has been defined.

The Commission would also like to take this opportunity to state that this preliminary approval should in no way be used to prejudice any other proposal to deliver natural gas to Vancouver Island that may come before the Utilities Commission.

17. The Islands Trust

The Islands Trust had been kept aware of progress of the corridor selection work since the inception of the project, as corridors were identified across many of the Gulf Islands. When the corridor across Valdes Island was nominated, they requested the chance to be shown the detailed pipeline route. Representatives of the Islands Trust, including the local

trustee, inspected the nominated route across Valdes Island, and concluded that the interests of the Islands Trust would be better served by a route over Valdes Island than over any other Island, and that the nominated route was agreeable to the Trust, provided that they were given a chance to review the details of all proposed works on Valdes Island.

Hydro is appreciative of the interest and cooperation from the Islands Trust during the planning of this project. Their support for the nominated corridor and routing across Valdes Island is also appreciated.

18. B. C. Harbours Board

The Board controls most of the land in southern Delta which the pipeline would cross, and the land at Brunswick Point where a shore station is proposed. They advised that, subject to negotiation on terms, they could accommodate a pipeline right-of-way and ancillary features on their land. It was preferred that the pipeline be located within an existing B. C. Hydro easement.

It was requested that the pipeline ROW be situated far enough from the B. C. Harbours Board railway in Delta provide an adequate room for heavy equipment to operate adjacent to the railway if a derailment occurred, and to prevent damage to the pipeline from a derailment.

The general agreement from the B. C. Harbours Board concerning the pipeline routing and locaton of shore station on their land is appreciated. A minimum separation of 50 m will be provided between the railway and pipeline ROW's. The use of existing ROW's is noted. The Harbours Board request to follow the electrical ROW to the dyke and then the dyke to Brunswick Point is discussed in this report.

19. B. C. Hydro

Electrical Transmission

The location of the pipeline ROW within, or adjacent to, existing electrical ROW's in Delta and on Vancouver Island was discussed and agreed to, as shown for the preferred route. The location accommodates B. C. Hydro's plans for changes to the electrical transmission system to the year 2008.

Electrical Operations

The operation of the High Voltage Direct Current (HVDC) system to Vancouver Island and its potential impact on pipeline protection and maintenance was discussed. The modes of HVDC operations were defined, calculations were made of currents that could occur in the pipeline for the most serious of these modes. These values were confirmed by field tests. It was concluded that the pipeline cathodic protection system could accommodate the operation of the HVDC system in the modes defined. The HVDC system was therefore not a restraint in pipeline location.

20. Regional Districts

Greater Vancouver Regional District

A presentation was made to the Planning Committee.

No specific issues were raised on routing.

Capital Regional District

Meetings were held with directors and staff of the District on two occasions in May and June 1981. Comments at the earlier meeting dealt with the (then) political controversy over the selection of a southern route, siting of transmission facilities

in Greater Victoria, the extent of possible gas service in Greater Victoria, and the method of pipeline construction.

Three concerns on the nominated route were raised:

a) The route is adjacent to a Development Reserve area south of Langford Lake, proposed for housing. Concern was expressed whether transmission pipelines are compatible with heating.

The route south of Langford Lake overlaps an electrical ROW which is immediately adjacent to the ENR and the Lake, and could not be within the developed area.

b) The terminus appeared to be in an area planned as a town centre.

The terminus will be at an existing B. C. Hydro substation on Jacklin Road and will not adversely affect the planned town centre.

(c) The aesthetics of the Langford Terminus.

It was agreed that the terminus should be appropriately landscaped.

These concerns were handled in a routine manner, through continued consultation with the District planning staff. At the following meeting, a staff report was presented that endorsed the nominated route, and recommended that:

1. The Board write to the Ministry of Energy and ask to be consulted in the routing of transmission pipelines within the District as proposed by competing companies.
2. That in the event that B. C. Hydro's preferred corridor is chosen, the Board endorse such a route subject to B. C. Hydro's consulting with the Planning Department concerning siting of the line and terminus as outlined in the staff report of 20 May 1981.

The first recommendation was passed; however the second one was removed after it was argued that the Board was already on record as supporting Powell River's bid for a northern route, and as other competitive bids are anticipated for facilities on the Island, the Board would be amiss in endorsing any aspect of B. C. Hydro's proposal.

Cowichan Valley Regional District

A meeting was held with the District staff, where it was indicated that their major concern lay with the choice of a route east of, rather than west of Duncan. There was some expression of doubt in combating negative feelings towards a pipeline which the staff felt may prevail amongst property owners east of Quamichan Lake. No opposition was expressed to the choice of corridor, and it was stated that formal recommendations and comments on the Corridor and Route Nomination report would be forthcoming at a later date. B. C. Hydro contacted the staff on several occasions afterwards, but no further comments from the District were ever received.

A variety of general comments were made with regard to routing and distribution on the Island, but no formal comment was made on the route to Cedar. No opposition was expressed with regard to the corridor or route from Tilbury to Cedar. It was suggested that contact be made with the Nanaimo/Cedar Farmers' Institute.

This was done.

Alberni - Clayoquot Regional District

A meeting was held with staff, questions raised on routing were:

a) Pipeline should use existing electrical ROW where possible.

Agreed.

b) Consider using the Foulcher Road substation site for the terminus.

An inspection was made, but B. C. Hydro prefers its original choice as discussed in Section 3.9.5.

c) Concern over conflict with tourists for accommodation in summer.

Potential conflict recognized.

d) Avoid Lacey Lake watershed.

Agreed.

e) Concern expressed regarding routing over farmland in DL 65. Suggested a contact with Farmers' Institute.

Crossing of Agricultural Land Reserve Lands is only permitted subject to conditions laid down by Land Commission.

Comox-Strathcona Regional District

A presentation was made to the Board and staff. Issues raised regarding routing were:

a) Was project aware of routing studies for new Island Highway?

Yes.

b) If the new highway is adjacent to 138 kV ROW could pipeline be in same corridor and constructed at same time to reduce description?

B. C. Hydro would prefer to be closer to coast from Courtenay to Campbell River to allow it to serve people.

c) Is it good practice to locate in agricultural land?

Yes, provided care is taken to restore drains and soil profile as the only loss is a season's crop for which compensation is paid.

21. Municipalities

Due to the curtailment of the public information program following the request to apply for the pipeline to the Island only, it was not possible to meet with representatives of all municipalities affected by the transmission pipeline. Meetings were held with the following:

Delta

A series of meetings with staff and presentations to the Council took place. Issues relevant to routing were:

a) The Council took the position that it did not want Delta to be used as a corridor by another utility going to Vancouver Island. It preferred to see a route through Powell River used.

The Council was reluctant to admit that other communities suffered corridors for utilities serving Delta.

b) Staff advised they preferred a routing in the B. C. Harbours Board land well south of Ladner, rather than one near Ladner.

The route has been moved as requested.

c) Staff requested that the route not interfere with municipal services.

Hydro recognizes the importance of these services and the route will be selected to minimize interference with them. Where there is a crossing Hydro will be responsible for all protective measures.

d) Staff requested that there be no disruption of field drainage.

Hydro will locate the pipeline below the present or proposed field drainage systems and will restore field drains cut during trenching.

e) Council preferred the use of existing rights of way.

B. C. Hydro recognizes the merits of use of existing ROW's and has relocated to be within, overlays, or be adjacent to existing ROW's where they exist.

f) Council preferred the route to be out of farmland.

It is not possible to achieve this in the western part of Delta.

g) Staff proposed an alternate route for the project lying through Burns Bog in the north-south leg and adjacent to the electrical ROW in the east-west leg.

The response is given in this report.

North Cowichan

A presentation was made to the Advisory Planning Committee. The following points were raised on routing:

a) If there was to be a buried crossing of Chemainus River a route east of the Island Highway was preferred.

B. C. Hydro agrees.

b) An industrial park is to be developed in worked out gravel area west of Duncan. Service to this was important but most residential growth was east of Duncan.

Service to north is possible from east or west route options.

c) Concerns expressed over Bonsall Creek and Richardson Creek on east route, an alternative alignment was proposed to avoid Lakeview Subdivision northeast of Quamichan Lake.

B. C. Hydro agreed to review east route.

d) Attention of Hydro was drawn to the Municipal Forest Reserve west of Duncan, it was preferred that this be avoided.

It was agreed to secure the particulars and avoid to the extent possible.

Port Alberni

A presentation was made to the Council, the follwing points relevant to routing were raised:

a) The Council preferred the Terminal to be at the Foulcher Road substation.

Hydro agreed to review selection.

b) Would there be any conflict with proposed Horne Lake Road?

No, Pacific Logging were proposing use on north side of Lake.

22. Indian Bands

Meetings were held with the two bands who might be affected by route selection.

Cowichan Band

A meeting was held with Band representatives to explain the project and its routing, at that time the route east of Duncan was preferred and permission sought to survey the river crossing sites in the Reserve. Permission was granted. No points on routing, other than in the Reserve were raised.

Qualicum Band

A meeting was held with the Band Council to explain the project and routing options in the vicinity of the Big Qualicum River, adjacent to the Bands reserve.

The following points were raised regarding routing:

a) The Band was very interested in protection of fish.

The river crossing would meet the requirements of Fisheries and Oceans.

b) The Band had designated an area on the bench in the northwest corner of the reserve as a graveyard, and asked that it be avoided.

The area would be avoided.

23. Group Interests

SPEC

A general response was received from SPEC dealing with energy policy and economic analysis without reference to routing, other than the opinion that the project was not necessary.

Delta Farmers' Institute

A meeting was held with the Institute and several meetings with a group of its members likely to be affected by the project. Concerns expressed regarding routing were:

a) There was a desire to see the pipeline routed out of farmland. If it had to be in farmland there was a strong preference to see it in tenanted farmland owned by the B. C. Harbours Board.

Hydro recognizes the preference.

b) There was concern over encroachment onto Crescent Island farmlands which are often intensively cultivated for vegetables. The preference was to route as far east as possible, preferably in Burns Bog.

The point of view was appreciated, the difficulties of using the bog were described and the conflicts with the municipal sewer.

b) Drainage was of major concern, as proposals existed to install deep drains.

It was agreed to consult with all parties to determine the appropriate depth of burial. The importance of retaining effective drainage is understood.

c) Much heavy farm equipment was used in Delta, it was desired that there should be no restriction to its continued use.

There had to be recognition that there was a limit as to what could be used over the pipeline. Hydro would adjust burial depth to accommodate standard equipment.

d) Use of a site for the compressor station south of BCDC Industrial Park would reduce need to traverse farmland.

It was agreed to review possible sites, and it was concluded that a favourable site existed, which is now preferred for use.

Cowichan Agricultural Society

A meeting was held with members of the Society, points regarding routing were:

a) Why not locate along the Island Highway?

The transmission pipeline is required to have a separate ROW for sake of safety. This would bring conflict with development along highway.

b) Preference expressed for route west of Duncan as it avoids more farmland.

The route selection would be reviewed.

c) Concern expressed about crossing of deep gully near golf course southeast of Duncan.

The situation is a difficult one, it will be further reviewed.

24. Comment from General Public

Public Meetings in Cedar

Two public meetings were held. The following points were raised with regard to routing, most questions related to ROW acquisition and construction methods.

a) A landowner advised of his private tree farm at the southeast end of Quennell Lake and expressed concern on blowdown if a ROW was cut through.

Area was noted for avoidance.

b) Concern was expressed over possible impacts on Roberts Bank.

The OIC 908 process was described.

Public Meeting in Delta

One public meeting was held in Delta. The following points were raised with regard to routing.

a) Could pipeline be carried on piled foundations across Burns Bog?

Yes, at great expense.

b) Why not follow existing gas trunk line through Burns Bog?

Route does not meet standards for a transmission line and consequences of failure are much higher for Vancouver Island pipeline.

c) Objection to route across privately owned farmland south of Ladner. Preference expressed to route over B. C. Harbours Board land.

Preference noted, and will be addressed as cost difference is low.

d) What is cost difference between routing through Burns Bog and farmland?

Uncertain at this time, possible a multiple of twice, or more.

e) Why not follow highway to Ferry?

Pipeline requires separate ROW and being adjacent to highway gives many problems.

f) Why not use a compressor site closer to Tilbury Island and avoid pipeline down west side of BCDC Industrial Park?

Such a site was being reviewed, it has proven out, and is now preferred.

g) In east-west leg why not route south of railway to reduce disturbance?

It requires two railway crossings and would require removal of a house at intersection with main road south from Ladner.

h) Following on from 7, why not then cross back to north side at this point?

An alignment can be found on north side that avoids developments and both rail crossings.

i) Is there room for pipeline between highway and rail to superport?

Gap varies but it is believed rights of way are adjacent. It is probable that future expansion of rail would cause problems.

j) Why is it necessary to avoid interchange for superport?

Because there are plans to modify this in future and its is not derived to have pipeline in use in area of construction activity.

k) Why are you sure southern route is better, and will your submit your work on north route for review?

Yes, as a result of cost estimates and economic analysis. It is anticipated Government or BCUC will review.

l) Does B. C. Hydro recognize that water table is deliberately kept high in Westham Island and other parts of Delta in summer to assist irrigation, and will there be requests to lower water table during construction?

The practice has been recognized. Hydro would prefer to have the water table lowered during construction but is prepared to cope with the practice.

m) Why not locate compressor station on McAllister property just south of BCDC land to avoid length of ROW on farm land to west of BCDC?

The suggestion is appreciated, the location is preferable but had not previously been considered as it is in ALR. It is now preferred site.

n) How much flexibility exists in routing?

Hydro will take comments received into amount and define a preferred route in its submission to any regulatory inquiry. Anybody may make their position known to the regulatory body who are free to set conditions including on routing.

Individual Queries

The following significant individual queries were received by letter.

a) Will gas be supplied to cabin owners on the east side of Valdes Island?

It is improbable as load is very small and intermittent and cabins are remote from line.

b) Could blasted rock from shore approach at Flewett Point be used to construct a breakwater for a small boat marina, possibly to extend Boat Harbour?

There would be some surplus rock but not enough for a breakwater. It would be very expensive to collect it off the seafloor. It is improbable the concept would be economic.

APPENDIX 2

FEDERAL GOVERNMENT COMMENTS AND B. C. HYDRO'S RESPONSE

Government of Canada / Gouvernement du Canada

Fisheries and Oceans / Pêches et Océans

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1090 West Pender Street
Vancouver, B.C.
V6E 2P1

Pêches - Région du Pacific
1090 rue West Pender
Vancouver (C.-B.)
V6E 2P1

File Pl. 750.6.1

June 19, 1981

Your file / Votre référence

Our file / Notre référence

5797-1

Mr. R. G. Blakely, Manager
Systems Design Department
BC Hydro Gas Engineering Division
3777 Lougheed Highway
Burnaby, B.C. V5C 3Y3

SYSTEM DESIGN DEPT.

JUN 24 1981

Dear Mr. Blakely:

Re: "Vancouver Island Natural Gas System Corridor and Route Nomination"

The above document has been reviewed by the Department of Fisheries and Oceans/Department of the Environment Task Force on the Vancouver Island Gas Pipeline. In general, the Task Force feels that the Terms of Reference: "Biophysical Impact Studies for Route Selection (Stage I)" have been met. Agency comments detailed below relate to identified deficiencies in the report, impacts associated with the nominated route, and recommendations for further (Stage II) studies. The Task Force did not review the Roberts Bank portion of the project in detail since this area is already under consideration by an interdepartmental committee established under Order-in-Council 908. It should be noted, however, that the Department of Environment and the Department of Fisheries and Oceans do have significant concerns regarding this area. Specific comments provided by each agency are listed below:

1. Environmental Protection Service

At this stage of the project no concerns within the EPS mandate were identified. It was noted, however, that a permit under the Ocean Dumping Control Act would be required for disposal at sea of dredge spoils including those displaced by side casting. Further, any herbicide use would require a permit from the Provincial Pesticide Control Branch. Review of this application by Federal agencies would be coordinated by the Environmental Protection Service.

2. Atmospheric Environment Service

The primary concern identified by the Atmospheric Environment Service was air emissions from the Tilbury Island compressor station. In the Stage II studies, specific details on the plant including the amount and nature of the emissions and methods employed to meet air quality standards are required. AES is of the opinion that existing meteorological data are adequate for this assessment.

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3. Canadian Wildlife Service

Specific comments on the report provided by the Canadian Wildlife Service are as follows:

(a) Corridors

The logic behind the selection of corridors appears to have been sound. However, it would have been very helpful if a flow diagram explaining the selection procedure were presented. This should seriously be considered for future reports.

(b) Routes (pp. 5-2, 5-3, Table 8-1)

The route selection criteria were not discussed in sufficient detail for Sturgeon and Roberts Banks.

The three route possibilities near Brunswick Point were not shown, and therefore it was difficult to "imagine" their impacts. Also, what does "past" Brunswick Point mean in reference to one of these three routes?

(c) Inspectors (pp. A3-2)

More information is required on the "environmental inspectors". Who? When? Expertise? Reporting on whom?

(d) Tables (pp. A5-13, A5-28, Tables A5-6, A5-13)

These tables were somewhat confusing, especially the column headings. Details for the Roberts Bank area should be provided.

Diving ducks and shorebirds are an important resource on Roberts Bank and due to their numbers and susceptibility to pollution and disturbance, their importance values should be given an H (high) instead of an M (medium). More detail is required on the wildlife and mitigative effectiveness ratings for Roberts Bank. Finally, the means by which the weighting factors were arrived at appears arbitrary (Table 8-1). Do 10 scientists represent general public opinion?

Habitats of most concern to the Canadian Wildlife Service on Vancouver Island are the coastal and inland wetlands which are used to a high degree by migratory birds, particularly waterfowl. Of special significance are the Class 1 to 3 wetlands that may come in close proximity to the pipeline

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right-of-way, especially between Courtenay and Campbell River. In finalizing the exact pipeline route, the Canadian Wildlife Service strongly recommends that BC Hydro avoid all these wetlands by at least 500 m and all other wetlands by at least 100 m. The following are some important wetland complexes which are near the pipeline route:

- those adjacent to Courtenay (Class 2S)
- those at and near Black Creek and Oyster River (Class 3M)
- those near Parksville and Little Qualicum River (Class 3M)

Additional information on these and other wetlands can be obtained from the Canada Land Inventory maps (waterfowl) and through discussion with CWS and BC Fish and Wildlife staff.

If wetlands are unavoidable (and this has been clearly justified), construction techniques should be used which would prevent any change to the hydrology and long-term productivity of the wetland. Revegetation of all disturbed wetlands is encouraged so that natural production is returned as soon as possible. Finally, CWS strongly urges BC Hydro to follow the existing powerline right-of-way as much as possible. This would minimize the amount of natural habitat disturbed.

4. Lands Directorate

It is the opinion of the Lands Directorate that Section 3, "Economic Effects of the Project" lacks sufficient detail to be useful. The report should clarify if gas will supplement woodwaste use in pulp mills or eventually replace it. Further, the cement works at Bamberton are identified as a major industrial user of gas, however, the current and future status of the plant is unclear. A more thorough socio-economic analysis should be part of the Stage II report. Specific comments on the report are outlined below:

(a) Seismicity

The effects of seismic activity have not been given sufficient attention. For example, the likelihood of a break and the probability of an explosion should be considered. This would be a real hazard after a seismic shock, especially where the gas line is near the power line.

(b) Fire Hazard

There is no mention of the potential fire hazard along the right-of-way, especially during the summer construction period. Also, what are the alternatives should the project be closed during a long fire season? Contingency plans for fires should be part of the Stage II work. The plans should be in place for all aspects of

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the pipeline construction, from clearing of the right-of-way to welding of the pipe.

(c) Shore Zone Sensitivity

The west shore of Valdes Island contains some rare and unique accretion shore forms for the Gulf Islands. These are very sensitive to disturbance of their down shore source material. The location of the proposed breakwater and dock should be given more study in terms of near shore sediment transport and the sources of that sediment.

(d) Land Use

(i) The preferred route crosses two main logging roads providing access to dry sort areas at Union and Buckley Bays. Provision should be made so that use of these roads is not affected by pipeline construction.

(ii) - BC Hydro mentions that their preferred route would use existing rail ROW's, both CN and CPR, for parts of the pipeline. As both railways are under federal jurisdiction, permission from the Canadian Transport Committee under the Railway Act, Pipeline Crossings under Railways Regulations, 1975 may be required. If refused, Hydro should identify their order of preference for the alternatives available.

- Use of the abandoned rail ROW; if it is CN jurisdiction, must be reviewed by the Treasury Board Advisory Committee for Federal Land Management. If CP, no permission is required from TBAC/FLM, except from the owner.

(iii) The preferred route crosses the Greater Victoria Water Supply Area. Hydro should state whether permission has been granted and if so, precautions they will take to prevent impacts to the water quality. This should include the after-construction maintenance of the ROW, for example, whether or not herbicidal spraying will be used.

(iv) It is unclear as to the fate of excess shotrock in areas where ocean dumping is not feasible. Is it to be permanently stockpiled, graded and revegetated, sold, used for road beds, etc.? Hydro should clarify this in the Stage II report.

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(v) The report mentions that special construction methods will be used through wetland and bog areas; these should be clarified for Stage II.

The following requirements have been identified for the Stage II study:

(a) Storage areas for equipment, fuel and the like should be identified and whether or not they are temporary or permanent.

(b) Hydro does not state whether or not there will be construction camps for the Vancouver Island section. There could be a shortfall of commercial accommodation at peak construction periods, therefore the possibility of construction camps should be identified.

(c) Access roads for pipeline construction, equipment supply and aggregate sources should be identified.

(d) All potential aggregate sources, whether existing or new, should be identified.

(e) Revegetation studies are necessary for all rehabilitation work of the ROW and any temporary facilities. The studies should look to using native plants and low growing shrubs to reduce the need for spraying.

(f) Identify methods of disposal of hydrostatic waste water and radio-isotopes from weld testing. The method proposed in the report does not consider low flow periods or contaminants in the discharge water.

5. Department of Fisheries and Oceans

The Department of Fisheries and Oceans has the following specific comments on the report.

(a) In section 6, "Project Setting", the corridor north of Nanaimo was not described since only one broad corridor was identified. We suggest that a general description of this corridor would assist in identifying terrain limitations and construction impacts.

(b) The information on aquatic resources (section 7.2) is very general and does not meet the following items in the terms of reference.

(i) Locations of important spawning and nursery areas were not identified.

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This information is required to determine potential impacts on fish populations and mitigation required.

(ii) Special and general abundance of vegetation and benthic fauna in the marine intertidal and subtidal zones were not mapped.

(c) Biological values should have been assigned to the numerical rating scheme used in section 8.2. For example, 1 may indicate a water quality concern, whereas 8 could indicate impacts on a major spawning area.

(d) The report states (p. A1-9) that hog fuel will be used to provide vehicle access in wet areas. Hog fuel breaks down to form a leachate toxic to fish, therefore this material should not be used or else removed immediately following construction.

(e) With regards to the "culvert and flume" method, the time when the culvert installed should be clarified. The statement on pg. A1-11, paragraph 3, which indicates that the culvert is installed when the ROW is cleared is ambiguous. In the Stage II report, a stepwise description of this method is required.

(f) Numbers as well as names of stream crossings should be used throughout the text. Figure A1-7 is difficult to use since unnamed creeks are not numbered.

(g) Construction methods for streams crossed by alternative pipeline routes were not identified in Tables A1-2 and A1-3. This information is required to make a valid comparison between alternatives. Further, construction timing is not identified for these streams or the following watercourses on the nominated route.

96 Niagara Creek
83 Johns Creek
62 Rocky Creek
56 Atlon Creek
51 Knarsen Creek
46 Craig Creek
43 Morningstar Creek
41 Whiskey Creek

(h) On the 1:50,000 scale, Wildlife and Aquatic Resources maps, it appears that fish resources at the crossing sites only were identified. The overall fish use of the streams should be noted as downstream effects are a concern (see attached table).

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(i) No criteria are presented for the low, moderate, high fishery importance rating used on the Wildlife and Aquatic Resource maps. In our opinion there are numerous inconsistencies. For example, Black Creek, a major coho stream, is rated only of moderate importance and Bonsall Creek, an important coho producer, is rated low. Further, several streams which support salmon (e.g., Hindoo Creek, Chef Creek and Little Annie Creek) were not rated as having any importance. It is the Department's position that the utmost protection should be provided to all streams which support salmon.

During May, 1981, Messrs. Mathers and Dane of DFO inspected the nominated and alternative pipeline routes with Mr. Messam, consultant to BC Hydro. The attached table lists all streams crossed by the nominated pipeline route plus streams crossed by the West Malahat option and an alternative pipeline route between Courtenay and Campbell River along the 138 kV electrical transmission right-of-way. The salmon species present and their utilization of each stream are identified, plus site conditions at the preferred crossing site and the potential impacts to fish populations are presented. To avoid repetition, impacts have been described in general terms only. A more thorough description of the impacts associated with pipeline crossings is provided below.

The primary concerns associated with pipeline construction are degradation of water quality and alteration or destruction of fish habitat. With regards to water quality, addition of sediment to the stream is the overriding consideration. Sediments can affect fish in numerous ways including smothering incubating eggs, loss of food supply, and avoidance reactions. Sediment is generated during construction of the stream crossing and by erosion or failure of adjacent stream banks. Construction timing is an important mitigation measure since any sediment added to the stream should occur only when fish are at the least risk. On Vancouver, this time is generally in July and August. However, during this period rearing coho are present in many streams, therefore, sedimentation must be avoided. In many streams sediment generation can be minimized by constructing the crossing in the dry using a culvert and flume technique. Other techniques, such as the use of straw bales to filter out sediment, can also be used. Erosion within the floodplain or failure of valley slopes is of particular concern since this can be a longer-term problem. Sediment may be added to the stream during critical life stages (spawning, egg incubation) of the salmon. The preferred migitation measure is to avoid unstable areas either by relocating the crossing or by use of an aerial crossing. Where this is not possible, slopes must be immediately treated to prevent erosion. Techniques such as seed and mulch, fibre blankets, or side drainage are required. Slopes, of course, must be mechanically stable before these measures are effective.

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Alteration or destruction of fish habitat can result from redirecting stream flow by river training or bank protection works; blocking or filling in side channels; altering drainage patterns or subsurface water flows; and/or removal of streamside vegetation. The latter can also occur when side channels are crossed or where the pipeline right-of-way parallels a stream. Cover provided by overhanging vegetation or undercut banks is utilized by rearing fish to escape from predators. Clearing and excavation at the crossing site will eliminate this cover. The most acceptable mitigation technique is to locate the pipeline in or adjacent to an existing right-of-way (e.g., 138 kV electrical transmission line right-of-way or highway right-of-way) where rearing areas are already disturbed. If this cannot be achieved, selected clearing at the stream crossing rather than clearing the full right-of-way is preferred. Finally, trees and shrubs should be allowed to re-establish adjacent to the stream.

In summary, the Nominated Pipeline Route appears to be acceptable from the Department's viewpoint with two exceptions: (1) The west Malahat alternative is preferred over the nominated east Malahat route since the west option involves aerial crossings of the Cowichan and Koksilah Rivers. Although more streams are crossed in the west option, site conditions are generally favourable. (2) A route from Courtenay to Campbell River along the 138 Kv electrical transmission ROW is preferred to the nominated route, as the former avoids numerous small waterbodies which support rearing coho (see also comments by CWS). Further, due to site conditions or sensitivity of resources, the Department feels that aerial crossings of the Goldstream, Koksilah, Cowichan, Chemainus, Nanaimo, Big Qualicum, and Puntledge Rivers should be investigated. Finally, where feasible, the pipeline should be located within or adjacent to existing right-of-way (e.g., electrical transmission or highway) to minimize disturbance to natural areas.

During the next phase of the study (Stage II) the following requirements have been identified by DFO:

(a) Evaluate the feasibility of using aerial crossings on the seven rivers identified above, and the consequences of selecting the two route alternatives proposed.

(b) Provide a detailed evaluation of the site conditions at each stream crossing including soil conditions, slope stability, groundwater discharge areas, vegetation cover, stream substrate, and stream bank type.

(c) Identify construction procedures including location of access roads (n.b. where possible, the same access road should be used for clearing, construction and maintenance); borrow sources; spoil disposal areas; stream crossing techniques; site dewatering methods; construction methods in wet areas; construction

.../9

scheduling (contingency plans are required in the event that pipeline work is halted due to high fire hazard); and testing procedures (source and amount of water, disposal of test water, resultant water quality); where blasting is required, information on size of charge; type of explosive (low v-s, high velocity); depth of charge; frequency of blasts; type of overburden and timing of blasting are required. On the foreshore, the preferred timing is June or July. A series of small delayed charges reduces the impact on fish. A monitoring program at the foreshore blasting site is required and should be outlined in this study.

(d) Describe mitigation measures designed to reduce construction impacts including techniques to minimize sedimentation, bank stabilization, seeding, slope stabilization and use of buffer strips.

(e) Outline vegetation maintenance procedures required on the ROW. The Department prefers mechanical clearing or ground spraying to aerial applications of herbicides. Further, a 10 m wide herbicide-free zone must be maintained on either side of the watercourse. Where feasible, stream banks should be permitted to revegetate naturally to restore hiding cover.

The Task Force is prepared to meet with BC Hydro if any clarification of the above report is required.

Yours sincerely,

J. S. Mathers, Chairman
Vancouver Island Gas Pipeline
Task Force

JSM/mmd
attach.

cc: J. Millen, EPS
S. Boyd, CWS
R. Morris, AES
M. Dunn, Lands
B. Hillaby, DFO
J. Broome, DFO

Alteration or destruction of fish habitat can result from redirecting stream flow by river training or bank protection works; blocking or filling in side channels; altering drainage patterns or subsurface water flows; and/or removal of streamside vegetation. The latter can also occur when side channels are crossed or where the pipeline right-of-way parallels a stream. Cover provided by overhanging vegetation or undercut banks is utilized by rearing fish to escape from predators. Clearing and excavation at the crossing site will eliminate this cover. The most acceptable mitigation technique is to locate the pipeline in or adjacent to an existing right-of-way (e.g., 138 kV electrical transmission line right-of-way or highway right-of-way) where rearing areas are already disturbed. If this cannot be achieved, selected clearing at the stream crossing rather than clearing the full right-of-way is preferred. Finally, trees and shrubs should be allowed to re-establish adjacent to the stream.

In summary, the Nominated Pipeline Route appears to be acceptable from the Department's viewpoint with two exceptions: (1) The west Malahat alternative is preferred over the nominated east Malahat route since the west option involves aerial crossings of the Cowichan and Koksilah Rivers. Although more streams are crossed in the west option, site conditions are generally favourable. (2) A route from Courtenay to Campbell River along the 138 Kv electrical transmission ROW is preferred to the nominated route, as the former avoids numerous small waterbodies which support rearing coho (see also comments by CWS). Further, due to site conditions or sensitivity of resources, the Department feels that aerial crossings of the Goldstream, Koksilah, Cowichan, Chemainus, Nanaimo, Big Qualicum, and Puntledge Rivers should be investigated. Finally, where feasible, the pipeline should be located within or adjacent to existing right-of-way (e.g., electrical transmission or highway) to minimize disturbance to natural areas.

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(b) Provide a detailed evaluation of the site conditions at each stream crossing including soil conditions, slope stability, groundwater discharge areas, vegetation cover, stream substrate, and stream bank type.

(c) Identify construction procedures including location of access roads (n.b. where possible, the same access road should be used for clearing, construction and maintenance); borrow sources; spoil disposal areas; stream crossing techniques; site dewatering methods; construction methods in wet areas; construction

.../9

scheduling (contingency plans are required in the event that pipeline work is halted due to high fire hazard); and testing procedures (source and amount of water, disposal of test water, resultant water quality); where blasting is required, information on size of charge; type of explosive (low v-s, high velocity); depth of charge; frequency of blasts; type of overburden and timing of blasting are required. On the foreshore, the preferred timing is June or July. A series of small delayed charges reduces the impact on fish. A monitoring program at the foreshore blasting site is required and should be outlined in this study.

(d) Describe mitigation measures designed to reduce construction impacts including techniques to minimize sedimentation, bank stabilization, seeding, slope stabilization and use of buffer strips.

(e) Outline vegetation maintenance procedures required on the ROW. The Department prefers mechanical clearing or ground spraying to aerial applications of herbicides. Further, a 10 m wide herbicide-free zone must be maintained on either side of the watercourse. Where feasible, stream banks should be permitted to revegetate naturally to restore hiding cover.

The Task Force is prepared to meet with BC Hydro if any clarification of the above report is required.

Yours sincerely,

J. S. Mathers, Chairman
Vancouver Island Gas Pipeline
Task Force

JSM/mmd
attach.

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19 October 1982

File: P1.450.6.1

Department of Fisheries & Oceans
Pacific Region
1090 West Pender Street
Vancouver, B. C.
V6E 2P1

Attention: Mr. S. Macfarlane

Dear Sirs:

Re: Vancouver Island Natural Gas Pipeline
Review of Corridor and Route Nomination Report

This letter is a belated answer to that of J. S. Mathers on behalf of the Vancouver Island Gas Pipeline Task Force dated 19 June 1981 (DFO Reference 5797-1). The reply has taken so long because of our need to assess the river crossing situations in the light of requests made in the letter and land use issues in the vicinity of some of the crossings. This letter deals with the issues in the sequence of Mr. Mather's letter, and presents our proposed final alignment and crossing plans for seven major rivers.

1. Environmental Protection Service

We concur that permits for ocean dumping will be necessary and that any herbicide use will be in accordance with regulations.

2. Atmospheric Environment Service

We note the requirement for details on compressor station emissions. It is now intended to use electric drives for the base load condition with gas units for peaking and standby, as a result emissions will be low. It is proposed they be dealt with at permit stage.

3. Canadian Wildlife Service

(a) We concur that a flow diagram might help in presentation of logic.

(b) The various route possibilities near Brunswick Point have been covered in detail for CWS representative in the OIC 908 process. We believe the CWS are satisfied with the analysis presented in that process.

(c) The environmental inspectors would be selected for the tasks they have to supervise. In general terms they would tend to be people with a background in soil science, aquatic and wildlife biology, agriculture and forestry. They would report to the B. C. Hydro contract manager and be responsible for ensuring the environmental requirements of the various contracts were met. They would be on the job while construction was underway.

(d) Tables

(i) We concur the table headings could have been more informative.

(ii) The impacts of construction on Roberts Bank have now been addressed more fully in the OIC 908 process and, we believe, in a manner acceptable to CWS.

(iii) With regard to the weighting, we agree the method is arbitrary and have so stated. To date we know of no other method of assessing impacts, and priorizing those impacts, that does not incorporate professional judgement. Therefore we feel that the method used, and the extent to which we have relied on professional judgement is justified. Our analysis has, in general terms, found wide acceptance.

(e) Habitat

The importance of the wetlands is recognized, the final routing favoured by B. C. Hydro avoids the wetlands listed, as requested.

4. Lands Directorate

It is stated on page 3-2 of our report that the intent of the project is to displace oil, and that the use of hog fuel on the Island will grow. In other words its use will not be curtailed. It is not considered desirable, for gas to compete with hog fuel use, even if it were economically feasible.

The Bamberton Cement Works has now closed and it is not considered to be a potential customer.

A more detailed economic analysis will be available at the time of B. C. Utility Commission hearings.

(a) Seismicity

The pipeline will be designed according to CSA Z.184 requirements which deals with safety issues.

(b) Fire Hazard

Fire season is a problem for construction during summer, particularly from Duncan to Victoria and Brannen Lake to Nanoose Bay, and north of Qualicum. The clearing of the right-of-way is scheduled for completion in early June in each year to minimize conflict with fire season. Weather and soil conditions limit construction to the summer period. The project will conform to the requirements of the Ministry of Forests for fire protection.

(c) Shore Zone Sensitivity

The proposed landing on the west side of Valdes Island is not close to the rare accretion shoreforms. The design of the landing will not interfere with lateral transport of shore material.

(d) Land Use

(i) The road crossings will be appropriately designed to meet requirements of their owners.

(ii) The preferred route crosses CPR right-of-way and such crossings will be dealt with under the Railway Act. The preferred route now avoids an unused CNR right-of-way in Delta.

(iii) The Greater Victoria Water District has agreed in principle that the pipeline may cross the Supply Area. The terms under which this will be permitted will be established by the GVWD.

(iv) The disposal of waste rock will be addressed when a final route is achieved.

(v) The usual method of construction through wetlands is to float the pipe in the excavated ditch, sink it with weights, back fill, and revegetate. The method will be shown in detail at the next stage.

Stage II Requirements

(a) Storage areas will be identified.

(b) Accommodation for construction workers is being investigated. B. C. Hydro would prefer not to use camps but agrees that competition with tourists should be avoided. A preliminary review suggests that existing trailer parks and cheaper motels can accommodate the workforce without competing with tourists.

(c) Access roads for construction will be identified.

(d) B. C. Hydro favours purchase of aggregate rather than development of new pits. If purchase is used it is difficult to predict which pits will be used. It is not understood why B. C. Hydro should identify such pits when removal of gravel from them is part of the normal commerce of Vancouver Island and as quantities are not great.

(e) B. C. Hydro believes that its experience on its existing rights-of-way precludes the need for revegetation studies B. C. Hydro prefers to encourage vegetation that need not be controlled by herbicides.

(f) The hydrostatic waste water will be disposed of in accordance with conditions set on the permit for its extraction. B. C. Hydro is aware of the need to prevent transfer of water from one system to another and to prevent pollution by contaminants.

5. Department of Fisheries and Oceans

(a) The point is noted. It was felt that Section 11 (Route Analysis) dealt with site specific issues.

(b) Section 7.2 is general and was intended to set the stage for an uninformed reader.

(i) B. C. Hydro did not identify the important spawning and nursery areas as it recognizes that all the east coast Vancouver Island rivers are important, and has agreed that every effort is needed to prevent siltation.

(ii) It is recognized that mapping of the intertidal and subtidal vegetation and fauna was not done, but at the time of the study the specific landing sites were uncertain and it was considered that this level of detail, if necessary, would be appropriate to a later stage of review. Since then B. C. Hydro has reviewed the distribution and timing of herring spawning in the vicinity of the shore approaches and the timing of blasting for the approaches.

(c) It is agreed this might be an improvement.

(d) Any hog fuel used for access roads will be removed immediately following completion of construction.

(e) Clearing of the right-of-way is scheduled to be done in April and May of a given year to avoid possible fire closure season after 1 June. The culvert is installed during clearing and it is intended it be left until after completion of the crossing in July or August.

(f) Agreed.

(g) B. C. Hydro regrets that some streams were missed from the Table. The appropriate information is as follows:

	Stream	Crossing Method	Timing
96	Niagara Creek	Culvert & flume	No restriction
83	Johns Creek	Culvert & flume	7 July - 1 Oct.
62	Rocky Creek	Culvert & flume	15 July - 1 Oct.
56	Atton Creek	Culvert & flume	15 July - 1 Oct.
51	Knarsen Creek	Not now crossed	
46	Craig Creek	Culvert & flume	15 July - 1 Oct.
43	Morning Star Creek	Culvert & flume	1 July - 1 Oct.
41	Whiskey Creek*	Culvert & flume	15 July - 1 Oct.

* This creek was included in Fig. A1-7.

(h) It is recognized that downstream effects are of concern. B. C. Hydro recognizes that maintenance of water quality is important for every stream from an aquatic point of view. Once this is accepted there is little need to map downstream resources. The aim is to maintain water quality and minimize siltation in every stream.

(i) The inconsistencies are regretted. B. C. Hydro concurs that full protection should be given to all streams supporting salmon. With regard to the rating criteria it is regretted that the rating system was not fully explained in the text. The rating method actually used is as follows, using the words of our consultant:

> Streams and rivers have been given two biological ratings (Table 1), according firstly to their contribution to commercial and Indian fisheries (salmon), and secondly to their contribution to recreational fisheries (salmon, anadromous trout, and resident game fish). These ratings are on a scale of 0 to 3 in increasing importance.

The ratings were based on the following criteria:

Commercial Fish Value
- 0 - salmon escapement of 0
- 1 - salmon escapement of 1 - 2000
- 2 - salmon escapement of 2000 - 10,000
- 3 - salmon escapement over 10,000

Recreational Fish Value - these ratings were derived from a combination of anadromous fish production and sport fishing angler days carried out on the stream. Generally, the recreational values were assigned as follows:

0 - no sport fish produced
1 - low numbers of sport fish produced and fewer than 100 angler days per year.
2 - 100 to 1500 angler days per year.
3 - over 1500 angler days per year.

For example, Cowichan River was given a Commercial Fish rating of 3, and a Recreational Fish rating of 3.

Koksilah River was given a Commercial Fish rating of 2, and a Recreational Fish rating of 2.

Hollings Cr. was given a Commercial Fish rating of 1, and a Recreational Fish rating of 0.

It must be made clear that judgement has been used in selecting what are arbitrary divisions for the biological rating scales. This was considered justified as the ratings were used to provide indices of relative importance of streams crossed by the pipeline in order to set a realistic focus for scheduling and mitigation techniques. The ratings were not intended as absolute indices of importance, nor was there any intent to relate these values to streams elsewhere in the province.

'Fisheries Importance' ratings on Maps 7A to 7O were based on the Biological Rating figures for each stream and river, with the total score (Commercial plus Recreation) determining the Fisheries Importance rating:

High Fisheries Importance - Total score of 5 or 6 (e.g. Cowichan R.)
Moderate Fisheries Importance - Total score of 3 or 4 (e.g. Koksilah
Low Fisheries Importance - Total score of 1 or 2 (e.g. Hollings Cr.)

Streams with a '0' score were not identified by these ratings on these maps.

DFO Summary Comments

1. B. C. Hydro has switched its preferred route to lie west of Duncan using aerial crossings of the Chemainus, Cowichan and Koksilah Rivers.

2. B. C. Hydro does not consider it appropriate to route along the 138 kV line from Courtenay to Campbell River as this would make service to many potential customers uneconomic. In addition the final preferred route avoids much more of the wetlands than the 138 kV route.

3. DFO suggested that B. C. Hydro investigate the use of aerial crossings of the Goldstream, Koksilah, Cowichan, Chemainus, Nanaimo, Big Qualicum, and Puntledge Rivers. Because use of aerial crossings has an important bearing on routing, this was done at this stage. It required considerable investment of time and effort as the crossings cannot be considered on their own but only in conjunction with the appropriate routing changes necessary to reach a site appropriate for an aerial crossing. In addition several crossings have to be linked together in the analysis due to their proximity to each other. The detailed analysis for each case is written up in the 'Final Route Analysis Report' for the project which will be available shortly, and which will be sent to you when available. A summary of the conclusions related to the crossings follows:

Goldstream

This is really a crossing of Goldstream and Waugh Creeks and siltation in either would impact downstream spawning areas.

Goldstream Creek has a steep 9 m high bank on the north side and a more gentle 6 m high bank on the south side. It is presently crossed by a 54" Ø watermain using a pipe bridge. Both buried and aerial crossing designs were reviewed.

B. C. Hydro prefers use of a buried crossing at this site for the following reasons:

1. The only significant objection to the buried crossing is the potential for erosion from the steep northern bank. B. C. Hydro has successfully constructed across steep sided gullies in Surrey (Brooke Road Ravine) and believes it can achieve similar success at this site.

2. It does not appear sensible to invest in an aerial crossing of Goldstream River while constructing a buried crossing of Waugh Creek, as the potential for downstream damage is the same for each. Waugh Creek is already crossed by one buried pipeline and a second is planned by GVWD.

3. There is a cost difference of $70,000 in favour of a buried crossing ($150,000 - $220,000)

4. The flow in the Goldstream can be regulated at the GVWD dam upstream to allow fluming during the low flow period.

A plan of the proposed crossing is attached together with a plot of a tacheometric survey of the crossing area. The GVWD staff agree with the crossing site.

Koksilah, Cowichan and Chemainus Rivers

In the 'Corridor and Route Nomination Report' it was indicated that the route east of Duncan was preferred to a minor degree over the route west of Duncan. The eastern route incorporated buried crossings of these three major rivers at sites considered appropriate by B. C. Hydro and its consultants. The western route used aerial crossings of all three rivers as the crossing sites are all at canyons.

Each route is about 29 km long and has certain land use issues associated with it as well as river concerns. After considerable study, and discussion with regional and municipal interests, B. C. Hydro has altered its preference to the west route as shown on Figs. 12.3 and 12.5. A general arrangement drawing of the proposed aerial crossings is attached.

Nanaimo River

The site proposed by B. C. Hydro for the crossing is on a wide floodplain with no natural high banks on which to locate the towers of an aerial crossing. The Regional District recently installed two buried crossings of watermains a short distance downstream of the proposed site and presumably met the requirements of DFO in so doing.

B. C. Hydro reviewed its options in the area in some detail, including the relocation of Cedar Junction, as described in the 'Final Route Analysis Report'. It was concluded that the proposed Y format using the present location of Cedar Junction and the proposed crossing site of the Nanaimo River was preferable to any other routing arrangement in that it avoided a crossing of Haslam Creek, was $1.39 million less costly, than any alternate and could be constructed in accordance with the appropriate environmental restrictions as demonstrated by the installation of the watermains.

Accordingly B. C. Hydro retains a strong preference for a buried crossing of the Nanaimo River. Drawings of the proposed crossing are attached.

Qualicum River

The cost of an aerial crossing at the most suitable site was estimated as $700,000, the type of crossing being similar to that proposed for the Koksilah, Cowichan and Chemainus Rivers but requiring a 285 m span.

The crossing of the Qualicum is complicated by the presence of both the natural channels of the Qualicum River and Hunts Creek, and the artificial spawning channel adjacent to the river. In many respects, the situation is ideal for construction of a buried crossing because the flow on the Qualicum River and the spawning channel can be controlled to a large very extent. The flow in the Qualicum is controlled by the dam on Horne Lake (operated by DFO), and most of this flow can be diverted

into the spawning channel (up to 120 cfs). A minimum flow of 25 cfs must be maintained in the river at all times. The flow in the spawning channel can be totally shut off, if required. Controlled flows, however, are only acceptable given that construction occurs during the acceptable "construction window", as is proposed.

A meeting with representatives of the various branches of DFO with an interest in the matter was held on site on 6 October 1982. The two routes shown on Fig. 5 were discussed and inspected in the field. There appeared to be mutual agreement, that the route marked (4) on the plan, upstream of the railway crossing, was preferable to that marked (2) downstream of the crossing, and that buried crossings along Route 4 were feasible.

The major technical problems appear to be possible siltation in the Qualicum River affecting water quality in the hatchery and potential erosion of the steep bank north of Hunts Creek which may include an exposure of the Quadra Sands aquifer. This bank will require special treatment to prevent erosion, using fabric and other measures.

Estimates were prepared for the buried crossings, Route 4 requiring $540,000 and Route 2 $760,000 between the two points marked PI on Fig. 5.

B. C. Hydro's preference is to use Route 4 with buried crossings. With the flow control available buried crossings can be constructed with very limited potential for siltation, will preserve the aesthetics of the site and will not interfere with hatchery operations. It is not anticipated that the pipeline will be looped within 20 years.

Puntledge River

The selected crossing site has bedrock exposed in the river bottom, which would require blasting if a buried crossing is used, however little disturbance of silt would occur. The major technical problem is the steep bank of sands and gravels on the north side of the crossing which could be prone to erosion if cut into for a buried crossing. The major concerns is that the intake for the Puntledge fish hatchery is downstream of the crossing site and may pick up silt. There is however, a favourable circumstance in that the hatchery can draw its necessary water from the penstock leading to the B. C. Hydro Puntledge hydropower station, and has done so in the past on payment for the electricity lost by diversion.

A watermain has recently been laid across the Puntledge River using a buried crossing at a site between the hatchery and the proposed pipeline crossing. The diversion from the penstock was used at this time to avoid any entry of silt to the hatchery. B. C. Hydro believes this could readily be repeated for construction of the gas pipeline crossing.

B. C. Hydro estimates the cost of an aerial crossing to be the same as for the Qualicum as the spans are identical, namely $700,000 while a buried crossing is estimated at $410,000. Given the recent successful achievement of a buried crossing B. C. Hydro proposes to construct a buried crossing recognizing that special measures will have to be taken to prevent erosion of the north bank. The cost of water diverted from the penstock during the construction period would of course be met by the project.

DFO requests that detailed descriptions of conditions at each crossing site be made during the next stage and that all construction details be identified at the same time.

B. C. Hydro is about to participate in an inquiry into the project leading, it is understood, to a hearing by the B. C. Utilities Commission. B. C. Hydro undertakes, if awarded a certificate to construct the transmission line on Vancouver Island, to present the requested information to DFO staff for review prior to finalization of design so that crossing design and construction can be harmonized with DFO requirements.

It is the opinion of B. C. Hydro that by achieving clearing of the route early in June in any year that the fire hazard will be much reduced. In any event the major river crossings would be part of a separate contract and should not be delayed by fire season as most are located on private lands or in nonforested areas.

Blasting conditions for marine work have been discussed with DFO staff and will be resolved prior to issue of construction specifications.

It has been the preference of the project to locate in agricultural land rather than forest land to reduce the amount of vegetation management along the route. It is the intent of the project to adopt revegetation methods that will lead quickly to restoration of native species of ground cover to reduce the need for use of herbicides. The project concurs with the Task Force view on use of herbicides.

Yours truly,

K. G. Farquharson

K. G. Farquharson
Environmental Coordinator

CL2G

Government of Canada / Gouvernement du Canada

Fisheries and Oceans / Pêches et Océans

Fisheries - Pacific Region
1090 West Pender Street
Vancouver, B.C.
V6E 2P1

Pêches - Région du Pacific
1090 rue Pender Ouest
Vancouver (C.-B.)
V6E 2P1

February 14, 1983

Your file / Votre reference
P1-450

Our file / Notre reference
5797-1

K.G. Farquharson
Environmental Co-ordinator
Vancouver Island Gas Project
B.C. Hydro
555 West Hastings Street
Vancouver, B.C.

Dear Sir:

Re: Vancouver Island Natural Gas Pipeline
Review of Corridor and Route Nomination

The Department of Fisheries and Oceans/Department of Environment Task Force on the Vancouver Island Gas Pipeline has now completed its review of your letter of October 19, 1982 and accompanying information. Specific comments provided by each agency are listed below.

1. Environmental Protection Service:

   No comments.

2. Atmospheric Environment Service:

   No comments.

3. Canadian Wildlife Service:

   No comments.

4. Lands Directorate:

   The Lands Directorate was generally satisfied with your response to their concerns but requested that two points be addressed namely:

   a) Seismicity:

      They expressed some concern over your intention to use CSA Z.184 as a standard for pipeline design. These standards are a design minimum and it was

felt that B.C. Hydro should consider the high seismic potential of Vancouver Island and utilize standards greater than that required under CSA Z.184.

b) Hydrostatic test water:

One of the major concerns of the hydrostatic testing is the probable use of methanol to remove excess water after the test. Further explanation of how you propose to dispose of the methanol is required should use of this substance be necessary.

Additionally, they do not believe that the water extraction permit will adequately cover concerns over the discharge of the waste water following testing and request further clarification of the permitting process.

5. Department of Fisheries and Oceans:

a) With respect to your comments on our item (b)(i) your intentions with respect to minimizing siltation are noted and appreciated. We suggest however that more detailed information on spawning and rearing areas is still required. This will enable better assessment of the potential impacts of stream crossings and may enable us to advise of possible minor changes to the route which would minimize impacts on productive habitat.

b) We are concerned with the proposed timing for R.O.W. clearing and installation of culverts. If this activity is undertaken in April in stream reaches above spawning habitat, the impacts of sedimentation caused by instream activity or overland runoff could be severe. In many streams, total emergence of salmon fry may not have been completed and heavy siltation could prevent fry movement out of the gravel. We would prefer that a buffer strip be left along the stream until such time as instream activity is undertaken. Instream work including culvert installations should be undertaken during the low flow months of June, July and August.

c) In view of the matters dicussed above, we must reiterate our concerns over the lack of information on the utilization by salmon of stream

reaches downstream of crossing sites (comment (h) in the Task Force's June 19, 1981 letter).

d) We have many problems with your method used to rate streams for biological importance. Firstly, the system does not rate quality of habitat and therefore does not consider future options as a result of stream rehabilition, stock enhancement, natural recruitment, or increases in human demand for recreational use of these areas. We also feel that to consider a population of 2000 salmon to have a low commercial value is unrealistic. This category would probably include most streams on Vancouver Island which cumulatively represent a major contribution to the commercial catch. Finally, although we appreciate the reasons for which the method was used, we cannot accept the degree to which arbitrary judgements have been made and the use of the results of this method.

e) With respect to your comments on aerial stream crossings we offer the following:

i) Goldstream River: One of the main reasons for objecting to a buried crossing in this area was our uncertainty as to the stability of the steep banks at this site. In your review, you have not dealt with this issue and we request that an assessment of the slope stability be undertaken.

ii) Koksilah, Cowichan, and Chemainus Rivers:
No comments.

iii) Nanaimo River:
No comments.

iv) Qualicum River: We have no objections to the buried crossings as shown, however, we request that the following conditions be adhered to. These items were discussed at the October 6, 1982 on-site meeting:

- minimum cover of pipeline at the river and channel crossings should be 2 metres.

- close liaison should be established with the Big Qualicum hatchery manager and maintained through construction period.

- B.C. Hydro should initiate the necessary steps to acquire R.O.W. agreements with DFO prior to construction.

In addition to the above, we would like to emphasize that the minimum flow of 25 cfs cannot be maintained for longer than 24 hours. A flow of 50 cfs could be maintained for a much longer period however.

v) Puntledge River: We request that B.C. Hydro reconsider the use of an aerial crossing at this site. Discussions with our district staff have indicated that the recent construction of the buried watermain caused major problems. The work in fact generated excessive sediment releases into the downstream reaches of the Puntledge River which provide spawning and rearing habitat for coho, chum, chinook, and pink salmon and anadromous and resident trout populations. We are therefore concerned that similiar impacts may be unavoidable with your crossing. In fact, your buried crossing poses an additional potential impact to these wild salmonid populations in that your crossing would require instream blasting.

f) We request that B.C. Hydro give consideration at this time to developing a detailed post-construction monitoring program along the pipeline route.

Your consideration of the above agency concerns would be greatly appreciated. If you have any questions please call me at 666-2827.

Yours truly,

S.A. Macfarlane, Chairman
Vancouver Island Gas Pipeline
Task Force

SAM/d10far

cc: J. Millen - EPS
M. Dunn - Lands Directorate
L. Retflavi - CWS
S. Nikleva - AES
G. Kosakoski - DFO

APPENDIX 3

FROM PROVINCIAL GOVERNMENT AGENCIES AND MUNICIPALITY OF DELTA

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

Parliament Buildings
Victoria
British Columbia
V8V 1X4

February 1, 1982.

File # 10.5.8

Project Manager
FEB 1 0 1982
V.I. GAS PROJECT

Mr. R.G. Blakely, Manager
System Design Department
Gas Engineering Division
B.C. Hydro and Power Authority
3777 Lougheed Highway
Burnaby, British Columbia
V5C 3Y3

Dear Mr. Blakely:

Re: Environment/Resource/Land Use Working Committee
Comments on Vancouver Island Gas Pipeline
Corridor and Route Nomination Reports

Enclosed please find the Environment/Resource/Land Use Working Committee comments on the Vancouver Island Gas Pipeline reports as forwarded to Denis O'Gorman by Joe Truscott of the Ministry of Environment. Mr. Truscott has included a summary as well as the individual comments themselves.

As we discussed in my office, I have not made any attempt to synthesize the comments further but have enclosed a copy of the new summary form that the Project Analysis Branch has devised for that purpose. You may wish to attempt to fit the comments into that form for your own use.

Should you wish to discuss the comments with the committee as a whole, we can arrange for a meeting at your convenience. In the interim, if you have any questions on the comments themselves, please contact either myself, Mr. Truscott or the individual authors as appropriate.

Yours sincerely,

Jamie Alley

Jamie Alley
Project Analysis Branch
Energy Resources Division

JA/mw

cc: Denis O'Gorman
Joe Truscott

Enclosures

Province of British Columbia

Ministry of Environment

MEMORANDUM

To: Denis K. O'Gorman,
Chairman,
Energy Project Coordinating Committee.

Date: December 22, 1981

File: Van. Island Natural Gas
10.5.8

Re: Environment/Resource/Land Use Working Committee Comments on the Proposed B.C. Hydro Natural Gas Pipeline Corridor and Route Nomination Reports.

We have received the majority of agency comments on the above report. Attached are a summary of those comments as well as copies of the detailed agency submissions. The proponents and their consultants are advised to refer to the individual comments since in most cases they provide more detailed information.

More detailed comments will be forthcoming from the Vancouver Island Fish and Wildlife Branch once they have received and reviewed the Aquatic Resources Study reports prepared in 1980 by Howard Paish and Associates.

Agencies which were contacted but have not responded are:
Ministry of Environment: Waste Management Branch, Victoria
Ministry of Energy, Mines and Petroleum Resources: Engineering and Inspection Branch.

The most outstanding issues raised in this review are as follows:

1) The reports generally meet the Stage I requirements of the Guidelines for Linear Development except for the following deficiencies:

   - More information is required concerning stream crossings from both water management and fisheries protection perspectives.

   - More use should be made of existing soils and terrain data for environmental and agricultural capability reasons.

   - More detail should be provided on prevention and repair methods associated with the submarine sections of the pipeline.

   - Greater attention should be placed on sensitivity of estuarine environments along with avoidance or management of impacts in those areas.

   - Attempts should be made to avoid high visual resource and natural hazard areas such as Horne Lake.

.../2

2) The Agricultural Land Commission finds the nominated corridor largely acceptable except for the section between Cedar Junction and Esquimalt, but prefers and has listed many alternative route sections to those nominated. The Ministry of Agriculture has chosen not to accept the nominated southern mainland route, preferring one of the routes not nominated.

S. J. Truscott,
Project Leader,
Assessment Branch.

SJT/lrw

Attachment.

c.c. I. Henderson

12-09 -1

Compendium of Provincial Agency Review Comments on:

Vancouver Island Natural Gas Pipeline

Corridor and Route Nomination Submission

by B.C. Hydro and Power Authority:

Date: December 22, 1981

A. MINISTRY OF ENVIRONMENT

Lower Mainland Region:

Fish and Wildlife Branch (B. Cox)

- The report appears generally to meet the Stage I requirements of the Linear Guidelines.
*- The proponent should recognize Roberts Bank environmental sensitivity because of its importance to waterfowl, shorebirds, fish and other biological resources. Further, no consideration appears to have been made of specific Crown reserves for fish and wildlife management in the Roberts Bank area.
*- More emphasis should be placed on preserving marsh, with a recommendation that the shore assembly be located inside the dyke east of Brunswick Point.

Waste Management Branch (H. Wong)

- Between nodes 1 and 2 a gravel road bed contains phenol manufacturing waste tars (E extension of 60th Avenue past 68th Street). Precautions should be taken to avoid disruption of this road which could result in some hazard. If the alternate route in this area is chosen, the proponent should avoid disruption of the leachate collection facilities for the Burns Bog refuse site. Hog fuel or similar construction materials should not be used near Arthur Slough or other creeks, to avoid leachate problems.

Vancouver Island Region:

Fish and Wildlife Branch (D. Morrison)

- The report contains information on non-mitigatable impacts, but does not include discussion of those which are mitigatable and what mitigation measures are proposed.

*NOTE: These items should be covered under Order in Council 908.

.../2

- Some overhead stream crossings are planned in areas where the water is quite deep. If plans exist to tunnel under highways perhaps this mode of crossing should also be considered in stream areas where impacts are likely.
- This Branch has requested a copy of the aquatic studies report prepared in 1980 by Howard Paish & Associates Ltd. before if can provide a detailed review of stream crossing plans. B.C. Hydro is providing the necessary reports to the Branch. Therefore, more detailed comments are expected in future.

Water Management Branch (W. Hollingshead)

- Most water management concerns are associated with stream crossings:
  a) Domestic water licences and supplies and associated impacts should be addressed in addition to fisheries concerns.
  b) Stream crossings will require approvals under the Water Act; this would require for each stream an inventory of water licences and applications, criteria used to decide on crossing location, stream scour depth estimates and methodology for determining them, bank protection designs, and one-in-five-year flow estimates. In addition, the applications should be accompanied by the 1974 Howard Paish and Associates report and the 1978 and 1979 Northwest Hydraulic Consultants reports. Compensation and mitigation issues associated with existing water licences must also be addressed.

Victoria MOE Agencies:

Air Studies Branch (B. Manna)

- Adequate stack height should be provided for discharge of NO_x gases, especially if water injection is not used to reduce the emission level.
- Measures should be implemented to control evaporation of hydrocarbon gases from the storage tanks.

Terrestrial Studies Branch (D. Blower)

- More recent detailed soil and agriculture capability data for Shawnigan Lake and Nanaimo areas is available than the RAB data used in the proponents report, and should be considered by the proponent.
- All terrain maps provided in the reports are accompanied by insufficient base data and methodology to allow them to be adequately assessed.
- Each map should contain a written description of:
  a) general area terrain (materials and processes)
  b) constraints and problems.

.../3

Assessment Branch, Victoria (J. Hnytka/J. Truscott)

A. Generally the report meets Stage I requirements. There are, however, a number of deficiencies, the major ones being outlined below:

- More information is required for recreation, visual, heritage, and aquatic resources.
- Further study and consideration of the West Malahat route is warranted due to potential wildlife recreation, and property conflicts in the East route area.
- Attempts should be made to avoid tidal marsh areas (e.g. Fraser Delta) as well as high visual resource and natural hazard areas (e.g. Horne Lake shoreline).
- Construction activities should be scheduled to avoid seasons when wildlife populations are staging, nesting, or wintering.
- Selection of the East Malahat route will result in less deer habitat loss than choice of the West route.
- Consideration should be given to impacts of blasting on water quantity obtained from rock fracture wells (East Malahat, Gulf Island).
- Because of recreational fishery importance, streams in the area should be researched for fish productivity, angler use, and potential mitigation procedures.
- Since NO_x emissions from compressors are expected to exceed allowable limits, appropriate treatment methods should be employed.

B. MINISTRY OF LANDS, PARKS AND HOUSING

Lands and Housing, Vancouver Island Region (D. McColl)

- The proponent failed to explain plans to minimize foreshore disruption with reference to existing and future recreational and aesthetic values.
- With reference to blasting impacts, the proponent has failed to describe the expected severity, what mitigation is proposed, and where waste rock and dredge spoil will be disposed of.

Lands and Housing, Lower Mainland Region (J.C. Leman)

- The benefit of use of this area for the pipeline should be studied relative to other potential uses such as recreation and agriculture.
- Public involvement should be reported.
- No description was made of extensive spur lines to Howe Sound and the Sunshine Coast, which would be major concerns. Are these to be later phases of this proposal or entirely new expansion proposals?

.../4

Lands, Parks and Housing, Victoria (W. Hubbard)

- No apparent concrete reason was given to explain why only two major route options were considered feasible.
*- The issue of intertidal zone revegetation should be addressed.
- If possible, Valdes Island construction should be scheduled to avoid eagle nesting time.
*- The shore assembly should be constructed within the Brunswick Point dyke.
- Procedures to detect underwater pipeline leaks should be described.
- Staff and construction personnel should be aware of the herbicide ban on the Gulf Islands, and in conjunction with aquifers.

C. BRITISH COLUMBIA AGRICULTURAL LAND COMMISSION (M.F. CLARKE)

- The main concerns include alienation of farmland, loss of crops, disruption of farm operations, topsoil damage, and disturbances of drainage pattern and groundwater supplie
- Generally the preferred corridor is acceptable except for the section from Cedar Junction to Esquimalt. The commission recommends an alternate corridor there.
- Many of the nominated route sections are not acceptable, and a list of recommended alternatives is provided.
- Further, a list of construction conditions is included which the Commission may attach to its final approval.

D. MINISTRY OF AGRICULTURE AND FOOD

Farmland and Resources Branch, Victoria (J.D. Anderson)

- The southern mainland route is not favoured because of agriculture dominating activities on lands which are highly capable for agricultural purposes. In several cases the authors underestimate agricultural capability potentially gained through proper water management. To avoid loss of productive lands and construction impacts on drainage and soil texture, the northern route is recommended.
- On Vancouver Island, the same corridor preferred by the Agricultural Land Commission is recommended along with the following additional mitigative measures:
    a) Compressor stations should be located away from livestock operations and productive land.
    b) Possibilities should be identified to avoid buildings and cash crops.
    c) Where possible the route should follow existing corridors or property boundaries.
- The Ministry wishes the proponent to maintain contact with district staff during surveying and final route

*NOTE: These issues should be covered under O.I.C. 908

.../5

selection to ensure minimization of agricultural impacts.
- Further requirements should be:
  a) Work scheduling to avoid soil compaction.
  b) Drainage control measures to avoid erosion.
  c) Provision of animal and farm implement crossings for construction areas.
  d) Statements on how terrain hazard and trenching impacts are to be mitigated.

E. MINISTRY OF PROVINCIAL SECRETARY AND GOVERNMENT SERVICES

Heritage Conservation Branch, Victoria (H. Diemer)

- This branch is in full agreement with recommendations outlined in the consultant report concerning heritage resources.

F. MINISTRY OF TRANSPORTATION AND HIGHWAYS

Engineering Branch, Burnaby (F.H. Christensen)

- This Branch will be responsible for ensuring that CSA Standard 2184-M1979, as well as standards in the Pipeline Act and Pipeline Regulations are followed if this project is implemented.
- The pipeline should be installed far enough from the Roberts Bank railway to avoid damage if train derailments occur.
- Reports fail to confirm that negative pipeline bouyancy will sufficiently counteract underwater currents which might cause transverse movement.
- Methods of inspecting underwater portions of the pipeline should be outlined.
- Equipment and associated procedures to be used and time required in repairing damaged portions of underwater pipeline should also be described.
- The operation pressure of the distribution pipes less than 6" in diameter (planned to be plastic) is not stated.

G. MINISTRY OF FORESTS

Strategic Studies Branch, Victoria (Viggo Holm)

- One comment received by telephone: It is preferable that the route, where possible, be linked within corridors used for other developments to avoid loss of productive forest land.

Province of British Columbia

MEMORANDUM

To: Dr. A.N. Boydell, Director,
Assessment Branch,
Assessment and Planning Division.

Date: 1981-10-27

File No. 17

Re: Vancouver Island Gas Pipeline: Corridor and Route Nomination Report

As requested in your memorandum of October 8, 1981, attached are comments from Region II Fish and Wildlife, Water Management, and Waste Management staff on the above cited report.

D. R. Hehn

Don R. Hehn,
Regional Director,
Lower Mainland Region.

DRH/sml

Attachments

BRITISH COLUMBIA
ENVIRONMENT
OCT 29 1981
ASSESSMENT
VICTORIA, B.C.

Province of British Columbia

MEMORANDUM

To: Bryan Gates,
Assessment Branch,
Assessment & Planning Division,
Ministry of Environment,
Victoria, British Columbia.

Date: December 8, 1981

File: Vancouver Island Gas Pipeline

Re: Assessment Branch Comments on Tasks Necessary for B.C. Hydro to Fulfill Requirements of the Guidelines for Linear Development (Vancouver Island Pipeline Report)

- Following is a summary of concerns raised by Jean Hnytka:

EXISTING ENVIRONMENT:

- Description of the existing environment is not sufficient in the areas of recreation, heritage and aquatic resources.

EVALUATION OF ALTERNATE ROUTES:

* - Because of possible conflicts with the preferred East Malahat route (Cowichan Indian Reserve, wildlife, or recreation concerns), further study of the West route should be conducted.

IDENTIFICATION OF IMPACT-RELATED PLANNING ACTIONS:

- The proponent should consider the following additional impact management measures:
    - Rehabilitation or enhancement of disrupted recreational areas.
    - Sites with high heritage resource potential should be examined extensively.
    - Non-herbicidal vegetation controls should be considered where the right-of-way crosses private land. Negotiations with landowners would be advisable before attempting herbicide applications.

PUBLIC CONSULTATION:

- The proponent should consider using public consultation as a tool to resolve problems concerning:
    - alteration of shorelines due to the Valdes Island to Flewett Point crossing;
    - conflict of recreational fisheries with visual recreational resources regarding right-of-way location in the Horne Lake area;
    - choice of stream crossings to maximize either economic or non-consumptive use of areas;
    - choosing the East or West Malahat route using community impacts or natural resource values as criteria.

- Regional public meetings should be held to encourage comments from the informed public through regional organizations and interest groups, rather than restricting meetings to a very localized area as has occurred so far.

INFORMATION REQUIREMENTS FOR PROJECT ASSESSMENT:

- Additional information is required in the following areas:
    - Existing and projected forest use in the West Malahat and Port Alberni areas, including evaluation of compensation required.
    - In-depth heritage resource evaluation in the right-of-way.
    - More detailed visual analysis of the area is required.

RECREATION AND VISUAL RESOURCES:

- The choice of routes based on the recreation inventory is questionable because field maps were prepared after field checks and study.
- To mitigate recreation resource losses in the Horne Lake area, a route well back from the lake shore should be investigated. This would also reduce the likelihood of shore slope failures due to blasting because this area is characterized by unstable slopes.
- Wide clearance should be given to Horne Lake Caves Provincial Park, as well as the uplands area near Port Alberni where similar caves might also be found.

WILDLIFE:

* - Selection of the East Malahat route is likely to result in reduced loss of deer habitat compared to the West route.
- Construction activities in important wetland, staging, or wintering areas (e.g. Fraser Delta, Horne Lake) should be scheduled carefully to minimize impacts on wildlife.

AQUATIC SYSTEMS:

- Special consideration should be given to impacts of blasting on water supply from rock fracture wells in the East Malahat, and settled Gulf Islands areas (Valdes excluded).
- Mechanical clearing of right-of-way should be done instead of using herbicides on private lands, Gulf Islands, or where stream or ground water contamination is possible. A pre-and post-construction stream monitoring program in mechanically cleared areas should be considered to assess recovery from siltation in order to determine compensation requirements.
- Many streams in the study areas are important for sport fishing; therefore, fish productivity, angler use importance, and also mitigation methods should be researched and described. Moreover, environmental supervisors should be employed to ensure compliance of contractors with environmental requirements.

.../3

- Appropriate treatment of NO_x emmissions from compressors should be employed, because it is expected that allowable limits will be exceeded. There should also be contingency plans for major gas releases in populated areas.

ENVIRONMENTAL HAZARDS

- Consideration should be given to Fraser Delta soil liquefaction from seismic activity and concomitant pipeline ruptures as well as slope stability problems in the Horne Lake area.

S. J. Truscott

S. J. Truscott,
Project Leader,
Assessment Branch.

SJT/lrw

Province of British Columbia

MEMORANDUM

To: G.A. West
Regional Manager
Fish and Wildlife Branch

Date: 1981-10-27
File: 0367

RE: Vancouver Island Gas Pipeline: Corridor and Route Nomination Report

As instructed, I have reviewed the above-noted report and have the following comments to make.

Generally, the report meets the Stage 1 requirements of the "Guidelines for Linear Development" issued by the B.C. Environment and Land Use Committee. The corridor and route selection methodologies are as good as can be expected based on the qualitative nature of much of the information. All in all, the consultants have done a good job of selecting a corridor and a preferred route within the corridor.

The Stage 2 Environmental Impact Assessment will further refine the route to avoid or reduce potential impacts and outline detailed mitigation measures. It is imperative that this stage be done properly to ensure that the impact on the environment, particularly the foreshore segment across Roberts Bank, is kept to a minimum.

Detailed comments on specific sections of the report are as follows:

Page 2-6: Salmon, such as coho, may utilize the lower reaches of the Elaho along with steelhead trout.

Page 2-10: Environmental and Social Impacts. Environmental impacts should be based on the "value" and/or sensitivity of the fish, wildlife and other resources encountered along the various routes.

Table 2-3: The habitat of Roberts Bank should be noted as sensitive because of importance to waterfowl, shorebirds, fish and other biological resources.

Page 5-2: No mention is made of the Crown reserves that cover portions of the Fraser estuary. For example, OIC Reserve No. 2374 established on September 18, 1961, designates all of Roberts Bank for wildlife management purposes. The same is true for Sturgeon Bank which has a Notation of Interest established in 1965 over 11,430 ha in the name of the Fish and Wildlife Branch.

...2..

Page 6-4: Georgia Strait. The tidal marsh has exceptionally high value to the estuarine system in addition to the marine and freshwater aquatic systems as stated in the report.

Page 7-3: Many other species of fish utilize the Fraser estuary in addition to those of commercial and/or recreational importance. These include Dolly Varden char which are important recreationally, flounder, sole, perch, etc.

Page 7-11: Wildlife. The intertidal zone, in-shore waters and beaches are also important to shorebirds, raptors and songbirds.

Page 8-11: Til/B
Marine
The Westham Island marshes are not saltmarshes but rather brackish/freshwater marshes.

Page 11-56: We would definitely prefer the shore assembly to be located within the dyke and east of the cannery at Brunswick Point to avoid <u>any</u> loss of marsh in this area.

Bruce Cox
Regional Habitat
Protection Biologist

BC/rc

Province of British Columbia

MEMORANDUM

To: Mr. Don Hahn
Regional Director
Lower Mainland Region

Date: October 27, 1981

File: 0-65

From: J. W. McCracken
Regional Manager
Water Management Branch
Lower Mainland Region

Re: Vancouver Island Gas Pipeline: Corridor and Route Nomination Report
Your file: 17

The report has been reviewed and I have no concerns or comments.

J. W. McCracken
Regional Manager
JWM/mh

Province of British Columbia

MEMORANDUM

To: DON R. HEHN,
REGIONAL DIRECTOR,
LOWER MAINLAND REGION,
MINISTRY OF ENVIRONMENT.

Date: OCTOBER 23, 1981

File: Vancouver Island Special Study

VANCOUVER ISLAND GAS PIPELINE: CORRIDOR AND ROUTE NOMINATION REPORT

This office has reviewed the above report with particular attention to the nominated southern corridor through Delta from nodes 1 through 4.

The initial portion of the nominated pipeline route, between nodes 1 and 2, intersects a gravel road where phenol manufacturing waste tars (reactor mass) from Dow Chemicals was used as a road bed material in 1966. The gravel road is the eastward extension of 60th Avenue past 68th Street. This material contains high concentrations of benzoic acid (60%) and some phenol (L.35%) and might pose some hazards if disrupted. The alternate pipeline route between nodes 1 and 2 might disrupt the leachate collection facilities for the Burns Bog refuse site. The above aspects should be investigated further.

There are no anticipated concerns between nodes 2 and 3 but Arthur Slough between nodes 3 and 4 should be protected from siltation as much as possible. As well, hog fuel or similar construction bed materials should not be used where leachate could gain access to Arthur Slough or any other creeks along the entire construction route.

In the marine intertidal area it is assumed that disruption of the tidal marsh before, during or after construction will be absolutely minimized.

H. Y. Wong, P.Eng.
Regional Manager.

GRG/fa

Province of British Columbia

MEMORANDUM

To: Bryan Gates,
Coordinator, Guidelines for
Linear Development

Date: November 4, 1981
File: 9-19

RE: Change in Membership of the Environment/Resource/Land Use Working Committee

Further to our recent telephone conversation, I request that you replace Mr. Bayne Vance with my name on your membership or distribution list for the above committee and any related committees. I would be particularly interested in providing an "input" into any committee deliberations that deal with pesticides or pest control problems.

Thank you in advance for your cooperation in this matter.

B. Cronin for

Ron W. Kobylnyk,
Director,
Pesticide Control Branch

RWK/bef

CC: Mr. B. Vance

Province of British Columbia

MEMORANDUM

To: Dr. A. N. Boydell, Director,
Assessment Branch,
Assessment and Planning Division.

Date: November 4, 1981

Att: Bryan Gates, Coordinator,
Guidelines for Linear Development.

Re: Vancouver Island Gas Pipeline: Corridor and Route Nomination Report

I requested comment on the proposal from my regional staff and from members of the R.R.M.C.

You will find enclosed material from my Water Manager (Mr. Hollingshead), Mr. Morrison, and Mr. Mathers of the Department of Fisheries and Oceans. Our Regional Waste Management staff have no comment on the proposal.

Presumably, R.R.M.C. members prefer to answer through their own Ministry rather than through the R.R.M.C. Chairmen.

J. C. Lyons, Director,
Vancouver Island Region.

JCL/td

Enclosures: Copies each of:
Memo from Hollingshead to Lyons, October 23, 1981.
Memo from Brady to Gates, September 29, 1981
Memo from Morrison to Lyons, November 4, 1981
Letter from Mathers to Lyons, October 14, 1981.

BRITISH COLUMBIA
ENVIRONMENT
NOV - 5 1981
9-11-81
ASSESSMENT
VICTORIA, B.C.

Province of British Columbia

MEMORANDUM

To: S. J. Truscott,
Project Leader,
Assessment Branch.

Date: November 24, 1981

Re: Vancouver Island Gas Pipeline: Corridor and Route Nomination Report

Further to our telephone conversation this morning, I am enclosing a copy of D. C. Morrison's comments relative to the above, as referred to in Mr. Lyons' memorandum to Dr. A. N. Boydell dated November 4.

T. Dudley,
Secretary to J. C. Lyons, Director,
Vancouver Island Region.

td/td

Enclosure

cc: Dr. A. N. Boydell, Director,
Assessment Branch.

Attn: Bryan Gates, Coordinator,
Guidelines for Linear Development.

Province of British Columbia

MEMORANDUM

0062 BCHydro-Gas Pipeline

To: J. C. Lyons, Regional Director

Date: 4 November, 1981

RE: B. C. Hydro - Natural Gas System, Corridor And Route Nomination Reports

I have reviewed only the marine aspects relative to this region at this point. Resource impacts upon fish and/or wildlife under our jurisdiction appear minimal considering the size of this project. However, this is not to say that significant problems may not exist for resources under the jurisdiction of Fisheries & Oceans, such as herring spawning. I have not yet had the opportunity to discuss this report with federal review agencies to date but propose to do so.

The report review relative to stream crossings on Vancouver Island will take more time to review as a more detailed evaluation of methods and data used in nominating a route is warranted. I will keep you informed as my work progresses.

MINISTRY OF ENVIRONMENT
RECEIVED
NOV 04 1981
NANAIMO, B.C.

D. C. Morrison
Regional Habitat Protection Biologist

DCM:bms
bcgeu

cc C. G. PROUSE, Regional Manager, Fish And Wildlife Branch
J. Walker, Chief of Habitat Management

Left phone call to Doug re Marine concerns.

Maps don't show
just say what our potential concerns are
We don't know what mitigative impact.

For a real specific route, must Rep Peterson
expect it would going out in the field when
because that might impact as a result of
meeting with F&WL
Even then can't say much re marine concerns.

Province of British Columbia

MEMORANDUM

To: Mr. Bryan Gates
Co-ordinator,
Guidelines for Linear Development
Assessment & Planning Branch
Ministry of Environment

OCT 02 1981

Date: September 29, 1981

File: IE 15.4.9

Re: "Corridor and Route Nomination Report" -
Vancouver Island Gas Pipeline

Reference is to your memorandum dated September 25, 1981.

Water Management Branch, Victoria, will not be commenting on this Report directly. We will, however, provide any technical or other support to the Regional Director of Environment upon request, and leave it to him to comment.

P.M. Brady, Director
Water Management Branch

cc: C. Lyons
Regional Director
Nanaimo

Province of British Columbia

MEMORANDUM

To: T. Oldham,
Manager,
Waste Management Branch,
Nanaimo, B.C.

Date: November 3, 1981

File: 3.4035

RE: "CORRIDOR AND ROUTE NOMINATION REPORT"
VANCOUVER ISLAND GAS PIPELINE - B.C.
HYDRO AND POWER AUTHORITY

Staff of the Climatology and Air Engineering Units of our Branch have reviewed the subject report and would like to make the following observations:

1) Consideration should be given to provide adequate stack height for the discharge of NOx from the compressor stations particularly if the type of gas turbines selected are not suitable for water injection to reduce the NOx level.

2) Provisions should be made to control evaporation of hydrocarbon gases from the storage tanks.

B. Manna

B.B. Manna,
Head,
Air Engineering Unit.

c.c. R.G. Wilson,
Director, Air Studies Branch.

Charles Lyons,
Director, Vancouver Island Region.

B. Gates,
Assessment Branch.

Province of British Columbia

MEMORANDUM

To: Bryan Gates,
Assessment Branch.

Date: November 13, 1981
File: #3.2106

Re: Vancouver Island Natural Gas Pipeline

The following are brief Terrestrial Studies Branch soils and terrain comments on the Vancouver Island Natural Gas Pipeline Corridor reports.

1. Information on terrain and agriculture are based on information from reconnaissance soil surveys of the Terrestrial Studies Branch. Recent more detailed preliminary information on soils and agriculture capability exists and is available from Nanaimo to Shawnigan Lake. Also, additional physical and chemical soil data will soon be available.

2. All the terrain maps are derivative maps and insufficient base data and methodology information is presented to properly assess them.

3. Each terrain map should have a written description of:

   a) general terrain within the area (eg. description of materials and processes).

   b) constraints and problems that exist within each map sheet.

A few agriculture capability related comments from our Kelowna Soils Unit have been sent directly to the Ministry of Agriculture in Victoria for possible inclusion with their other agriculture comments.

Dan Blower,
Terrestrial Studies Branch.

DB/aj

Province of British Columbia

MEMORANDUM

To: Mr. Bryan Gates
Co-Ordinator
Guidelines for Linear Development
Ministry of Environment
BUILDINGS

Date: 81-10-26
File:

Re: "Corridor and Route Nomination Report - Vancouver Island Gas Pipeline - B.C. Hydro and Power Authority"

In reviewing the report and atlas volume, there are one or two aspects of the proposal that we would like to see further clarified.

In general, it seems that impacts on vacant Crown upland areas and Crown foreshore areas are less clearly detailed than are potential biological and marine impacts.

This raises the question of what methods Hydro will employ in minimizing disturbance of foreshore areas - particularly with respect to recreational and aesthetic values. Also, no assessments or indications are offered with respect to the anticipated effects on future Crown upland and foreshore use options.

Several areas of proposed major blasting on and in close proximity to the foreshore raise questions of 1) how adverse the impacts of such activity will be; 2) how such impacts will be dealt with (i.e. reclamation, if any); and 3) where the material from such blasting or dredging will be disposed of.

It would be useful from our point of view if these potential impacts on Crown upland and foreshore areas and relevant mitigation proposals could be clarified.

D.C. McColl
Regional Director
Vancouver Island Region

GSM/ef

Province of British Columbia

MEMORANDUM

MINISTRY OF ENVIRONMENT
RECEIVED
OCT 23 1981
NANAIMO, B.C.

To: J.C. Lyons
Regional Director
Vancouver Island, Region 1

Date: October 23, 1981

Re: Vancouver Island Gas Pipeline

In response to your memo of October 15, 1981, I have the following comments:

1) I expect that each stream crossing will require an approval under the Water Act at a future stage. To support an application we would expect a detail design, schedule, and hydrologic estimates for each crossing, well in advance of the start of the project. Prior to final site selection and preparation of designs, I would expect the applicants to carry out a water rights map and file search to determine existing water licences and applications in proximity to and downstream of the route and ensure that all prior water rights are considered.

2) Page xxd., 2nd paragraph.

The report does not describe the considerations that this team used to site stream crossings. This information should be provided to support any applications for stream crossings.

3) Page 48, paragraph 6 and 7.

The reports prepared by Howard Parish and Associates, 1974, and Northwest Hydraulic Consultants, 1978 and 1979, should be provided to support application for stream crossings.

4) Page 7 - 4, Freshwater Systems.

Aquatic Resources appears to only include instream fisheries use. Industrial, community, and domestic water supplies should also be considered.

5) Page 8 - 2, Table 8 - 1 Impact Ratings.

Freshwater assessment does not appear to consider surface water supplies that are presently licenced.

6. Page 9 - 6, 3rd paragraph.

We would expect estimates of scour depth to be supplied for each stream crossing together with the methodology and data used for the estimate.

... 2/

7) Page 11 - 61, River Crossings.

The affect of the crossing on all existing water licences must be addressed prior to final site selection. Bank protection designs will be required to support any application for approvals under the Water Act.

8) Page A 1 - 10, A1.2.3, River Crossings.

Only fisheries concerns are addressed. Many licenced water supplies exist downstream of the proposed route and the affect particularly on community supplies should be addressed.

9) Page A 1 - 11, 4th paragraph.

We would expect to receive the one in five year flow estimate for each crossing for the construction period together with the supporting data and methodology.

10) Figure A 1 - 6.

How were the widths for the deep bury section determined? We would expect sufficient geotechnical information to support the estimates of scour depth and extent of scour for each crossing.

11) A1.5.2, A1.6.2.

Design discharge should be provided for each crossing site.

12) A3.1, A3.2.

Compensation or mitigation will be required for disruption or damage to licenced water supplies.

13) Page A 5-7, Tabe A 5-3.

I do not understand how the impact of the pipeline construction on wells can be assessed until the exact location and depth of excavation is known in relation to each well and operating water levels in proximity of the proposed pipeline.

14) A5.5.2, Freshwater Resources.

The ratings consider fisheries use only and do not consider existing water licences.

No 11 .0

Province of British Columbia

MEMORANDUM

To: Mr. Bryan R. Gates,
Co-ordinator,
Guidelines for Linear Development,
Ministry of the Environment

Our File: 0357643

Your File: _____

81-10-19

Re: Proposed Vancouver Island Natural Gas System Crossing of Roberts Bank (Corridor and Route Nomination for Vancouver Island Natural Gas System - Stage I Report)

This report has been reviewed in some detail. As with most B.C. Hydro reports, it contains such an enormous wealth of detail that it is difficult to know exactly how to approach it. Certainly, on a superficial basis, it would appear that B.C. Hydro has put forward a very reasonable proposal, but there are a number of unanswered questions. One of these is "Upon what basis was it decided that only two major route options were feasible?" We are given no concrete reasons for such a decision. Further, since the northern option is so obviously unacceptable, one feels that one is being steered or manipulated in exactly the direction B.C. Hydro wishes with regard to the routing of this project. As a consequence, it is difficult to do anything other than comment, in general terms, upon the proposed "preferred route". Comments are appended below.

Residual Impact Rating p. 8-2

Revegetation of inter-tidal zone of estuaries should certainly be attempted, although pioneering of techniques may be necessary.

Route Analysis p. 11-4

It is difficult to comprehend fully why this report has narrowed its concerns when, at this point, such information gaps as that regarding possible submarine restraints on the west side of Valdes Island exist.

p. 11-12

Assuming that the Canoe pass option for routing proves unacceptable, will the Westham Island route be utilized, despite its very high environmental impact?

. . . 2

p. 11-13

Can construction on Valdes Island be so scheduled as to avoid eagle nesting time.

p. 11-29

As Bamberton cement plant has now been closed, the section dealing therewith is now irrelevant and any decision making based on the necessity of this supply should be reconsidered.

11.3 Description of the Nominated Route pp. 11-55 ff

p. 11-56

It is strongly recommended that the shore assembly be located within the reconstructed dyke at Brunswick Point or alternate location as it would appear that this will substantially reduce impact on inter-tidal and sub-tidal areas.

p. 11-57

Location of waste dumps in areas where the proposed pipeline will travel through predominantly rocky areas must be addressed in Stage II as must all reclamation concerns and strategies.

It is assumed that, in the course of construction, all due care will be taken to avoid siltation of rivers and creeks and that rip-rapping, diversion of flow, etc. will be carried out to the highest standards. Guidelines similar to those adopted by the National Pipeline Agency are recommended. It must especially be assured that streams do not channel themselves along the pipeline route and that the whole of the pipeline route will be recontoured and revegetated except in those areas existing below the lowest depths where vegetation normally occurs.

Project Description pp A1-1 ff

p. A1-30

It is anticipated that, under certain weather conditions occurring quite commonly within the Strait of Georgia, pipe laying by the proposed method will be rendered very difficult, if not impossible.

It is unclear how potential leaks in the under-water portion of the line will be detected.

Social and Community Issues pp A2-1 ff

Maintenance Procedures pp A2-10 - A2-11

It must be ensured that not only B.C. Hydro planning staff but also field maintenance crews are aware of the prohibition against using herbicides on the Gulf Islands or in conjunction with any aquifer.

Compensation and Mitigation pp A3-1 ff

A3-1 Compensation

It may prove that compensation may be necessary to the Ministry of the Environment and/or the Federal Department of Fisheries should severe and unexpected damage occur to fish rearing or spawning areas encountered during construction.

W. Hubbard,
Biologist

c.c. D. McColl
Regional Director
Victoria, B.C.
Attention: R. Mitton

Province of British Columbia

Ministry of Lands, Parks and Housing

Parks and Outdoor Recreation Division

3-4-6-14

Lower Mainland Region
1610 Indian River Drive
North Vancouver, B. C.
V7G 1L3

81-10-23

Bryan Gates
Co-ordinator,
Guidelines for Linear Development
Ministry of Environment
Assessment and Planning Division
765 Broughton Street
Victoria, B. C.
V8W 1E3

Dear Mr. Gates:

Re: "Corridor and Route Nomination Report"-
Vancouver Island Gas Pipeline
B.C. Hydro and Power Authority

Having reviewed the above report it appears that the proposal in general terms, circumnavigates most major resource values, reducing the possible impact; however despite this, there will still be considerable infringement on the environment. The 16. km of the southern option having a high potential for adverse environmental impact is certainly advantageous over the 141 km impact of the northern option. However, the 16 km lies within a more heavily used area where the demand for land and all resources is extreme. As the need for this energy source is great and the compromise on the environment inevitable, the maximum benefit possible from this project should be studied. The use of the right-of-way for other compatible activities such as recreation and agriculture should be considered to make optimum use of the resource. * Where the pipeline passes in/near significant visual, recreational and historic features, a generous buffer should also be considered. Other ideas to enhance or use the right-of-way should be solicited from other agencies and the public.

With reference to the public participation during the course of the project, this information and the concerns expressed by the public is not recorded in the report and should be indicated with specific reference to how the pipeline has dealt with these public issues.

.....2

The major concerns of the pipeline in the Lower Mainland will be the extensive spur pipeline to Howe Sound and the Sunshine Coast. In describing the pipeline system no reference is made nor is there detailed information provided. It is unclear whether this is a later phase of the proposal or whether the annotation in the report refers to a potential future expansion. Until such time as this aspect becomes realized and when the alignment becomes definitive, further detail review will be limited.

I trust these comments will be of assistance.

Yours truly,

J. C. Leman
Regional Director
Lower Mainland Region

/slc

British Columbia
Agricultural
Land Commission

Telephone (604) 294-5211
4940 Canada Way
Burnaby, B.C. V5G 4K6

23 October 1981

Reply to the attention of:
Kabel Atwall

Mr. Bryan Gates
Co-ordinator, Guidelines for
Linear Development
Ministry of Environment
Assessment Planning Division
Parliament Buildings
Victoria, B.C.

Dear Mr. Gates:

Re: "Corridor and Route Nomination Report"
Vancouver Island Gas Pipeline - B.C. Hydro and Power Authority

Pursuant to your memo of 25 September 1981, please be advised that the Commission has reviewed the above referrenced report and in keeping with its mandate, the Commission is concerned mainly with the impact that the proposed pipeline could have on agriculture.

Consequently, as the actual marine crossing portion of the proposed gas line has no impact on agriculture, the Commission has no comments to make on this aspect of the line. The Commission, however, is very concerned about the route chosen for the line not only on the mainland but also on Vancouver Island as agricultural lands will be impacted.

Some potential concerns of the Commission include the alienation of farmland, loss of crops, the disruption of farm operations, the damage to topsoil and the disturbance of drainage patterns and groundwater supplies.

Therefore, the Commission in making a decision on a preferred corridor and route will endeavour to avoid agricultural lands and where this is not possible, it will outline mitigation factors that will, hopefully, minimize the impact on agriculture.

Once the Commission has made this decision, your office will be notified immediately of its concerns and decision.

Yours truly

AGRICULTURAL LAND COMMISSION

per:

M. F. Clarke, Chairman

KA:js

British Columbia
Agricultural
Land Commission

Telephone (604) 294-5211
133 - 4940 Canada Way
Burnaby, B.C., V5G 4K5

REPLY to the attention of:
Kabel Atwall

12 November 1981

Mr. K. G. Farquharson
Environmental Co-ordinator
Vancouver Island Natural Gasline Project
B. C. Hydro and Power Authority
4940 Canada Way
Burnaby, B.C.
V5G 4K6

Dear Mr. Farquharson:

Re: Vancouver Island Gas Pipeline

Please be advised that the Commission has had an opportunity to review the Vancouver Island Natural Gas System Corridor and Route Nomination Study and by Resolution #1969/81 has adopted the following position with respect to the preferred corridors and nominated route within the corridor.

In regards to the corridor, the Commission is in agreement with the preferred corridor as outlined in the Study for the Tilbury Island - Canoe Pass section, the Canoe Pass - Cedar Junction section, Cedar Junction - Campbell River section, and the Alberni Lateral. However, for the corridor from the Cedar Junction to Esquimalt, the Commission prefers corridor CFGHIKLMO/Esq. as this corridor would minimize the impact on agriculture in the area. As such, this is the only corridor the Commission would consider approving.

As to the nominated routes within these corridors, the Commission prefers the following routes:

1) Mainland to Vancouver Island
   1, 2, 3, 4, 5, 7, 8

2) Cedar Junction to Campbell River
   8, 9, 12, 200, 203, 204, 205, 206, 207, 208, 209, 210, 212, 213, 214, 215, 216, 217, 218, 219, 220, 22, 224, 226

3) Cedar Junction to Esquimalt
   8, 9, 10, 100, 101, 102, 105, 106, 110, 112, 115, 118, 119

It should be noted that these approvals are only preliminary and that final approval will not be forthcoming until the Commission has had an opportunity to review the final right-of-way proposal.

. . . /2

In addition, listed below, are some conditions which the Commission may attach to its final approval. These are being provided now so that they may be incorporated into the planning process.

1 Applicant to store topsoil separately during trenching so it can be replaced on the surface during backfill.

2 Applicant to replace and/or repair all drain systems that are disrupted.

3 Applicant to bury the pipe at a sufficient depth to ensure that there is no hinderance to any cultivation activity including deep ploughing and subsoiling.

4 Applicant to ensure that the existing natural drainage pattern is not adversely affected.

5 Applicant to provide appropriate surface and subsurface drainage during the construction period.

6 Applicant to insure that construction activity is contained within the right-of-way and designated work space.

7. Applicant to minimize impact on surrounding land by using dust control, strict rules on trespass, noise abatement, compensation where necessary, interim drainage and irrigation systems to avoid interruptions, and other methods deemed necessary.

8. Applicant to ensure that the subsoil materials excavated during trenching do not contaminate the soils of the storage area.

9 Applicant to grade and deep plough the right-of-way if appropriate.

10 Applicant to replace any existing irrigation and drainage system which is disturbed during construction and applicant to ensure that future irrigation and drainage works can be installed over the pipeline.

11 Right-of-way to be restored to its original capability or better.

12 Applicant to remove excess subsoil resulting from construction.

13 Tile drains that are cut during the trenching operation are to be suitably plugged to prevent debris and silt from blocking the drainage system.

14 All open drainage ditches should be repaired and reseeded properly using appropriate soil stablization procedures.

15 Applicant to dispose of excess excavated materials, stones, construction debris, trees, tree stumps and brush in a manner compatible with existing land use.

16 Final reclamation should include reseeding of appropriate areas.

17 Applicant to control weed growth during construction and to ensure reseeded areas are weed free after reclamation.

18 Applicant to locate stand pipes at fence lines and not in cultivated fields.

19 Applicant to locate gate stations or other structures on lands outside of the Agricultural Land Reserve.

20 Applicant to give reasonable notice of scheduling of the movement of materials, construction and normal maintenance and repairs to landowner and occupant.

21 Applicant to schedule and select construction equipment and techniques so as to minimize soil compaction. Work should take place when the soil water content is below the plastic limit.

22 Applicant to ensure that no topsoil is mixed with subsoil and/or eliminate compaction that may occur during construction.

23 Applicant to conduct no work during excessively wet soil conditions (wet weather and snowmelt).

24 No storage of fuels and fuel dumping in the Agricultural Land Reserve.

25 Applicant to schedule construction on Agricultural Land Reserve lands in order to minimize the disruption of agricultural operations and lands.

26 Applicant to use existing access roads wherever possible.

27 No gravelling of access roads in cultivated areas and removal of any temporary base, such as hog fuel, after use.

28 Applicant to select access routes in consultation with land owner.

29 Where requested by the landowner, applicant to provide access routes across the right-of-way during all phases of construction for all normal movements of farm equipment or animals.

. . . /4

30 Applicant to compensate for the loss of any crop, any future production and for the disruption of a farming operation.

31 Compensation for damage to the soil and crops resulting from leakage or breaks should be agreed upon prior to construction.

Although the foregoing is a fairly exhaustive list of conditions on which the Commission could be making part of its approval, it should be noted that more specific mitigation factors could be outlined once a final right-of-way has been defined.

The Commission would also like to take this opportunity to state that this preliminary approval should in no way be used to prejudice any other proposal to deliver natural gas to Vancouver Island that may come before the Utilities Commission.

Yours very truly

AGRICULTURAL LAND COMMISSION

per:

M. F. Clarke, Chairman

cc: Bryan Gates, Ministry of Environment

: Denis O'Gorman, Ministry of Energy, Mines & Petroleum Resources

: Greater Vancouver Regional District

KA:js

Province of British Columbia

MEMORANDUM

Mr. Bryan Gates
Co-ordinator
Guidelines for Linear Development
Assessment Branch
Ministry of Environment

November 9, 1981

VANCOUVER ISLAND NATURAL GAS SYSTEM

This is to acknowledge receipt of your letter of September 25 concerning the above mentioned project. The Ministry of Agriculture and Food has reviewed the Corridor and Route Nomination Summary, Text and Atlas documents and have the following comments.

Nominated Corridor:

Lower Mainland. The Ministry of Agriculture and Food does not favour the southern route option. Agriculture is a dominant activity in Delta, which contains some of the highest capability lands in the lower mainland. It supplies a large portion of the potatoes, vegetables and some of the dairy products in the lower mainland.

Due to inherent soil drainage conditions and soil texture, the use of heavy pipeline construction machinery could prove to be very detrimental to the productivity of these lands. Also, due to their relative importance to the lower mainland's agricultural markets, disruption of the agricultural operations in Delta must be kept to a minimum.

The Ministry of Agriculture and Food would prefer the northern route option as the impact on agriculture would be minimized.

Vancouver Island. For obvious reasons, it is accepted that the pipeline route must be located on the eastern coastal plain; however, impacts on agriculture could be further reduced. Compressor stations must be located away from intensive livestock operations and from high capability agricultural land. A greater effort must be made in identifying avoidance possibilities (i.e. pipeline route altered to avoid farm buildings, fields with high cash crops). Pipeline route should follow existing linear corridors where possible and located along property boundaries. (This would be most applicable to the southern latteral, around the Ladysmith, Mt. Richards and Duncan areas.)

Through the application of the above mentioned proposals, impacts on agricultural operations can be minimized. The Ministry would appreciate contact by the proponent with district staff during the surveying and final route selection stage of the project in order to ensure agricultural impacts are minimized.

Corridor Impact:

Commitments for Mitigation and Avoidance of Adverse Impacts

Commitments made by B.C. Hydro for agriculture should also include:

- Scheduling of work to minimize soil compaction.
  - Movement and operation of heavy equipment should be scheduled to avoid periods when soils are excessively wet.
  - Use of rubber-tired vehicles as opposed to tracked vehicles.
- Appropriate provision for surface and subsurface drainage.
- Where requested by landowner, access routes across the easements or temporary work area should be provided during all phases of construction for all movements of farm equipment or animals.

If you require clarification of our comments or further information, please contact Mr. Harvey Sasaki (387-5121, station 307). I would appreciate your changing of the mailing list to read myself as being the Ministry of Agriculture and Food's representative on the Committee.

J.D. Anderson
Director
Farmland Resources Branch

cc: W.E.A. Wickens
Dr. M.F. Clarke

HWS: sds

Province of British Columbia

MEMORANDUM

Mr. B.R. Gates
Co-ordinator
Guidelines for Linear Development
Assessment Branch
Ministry of Environment

November 19, 1981

VANCOUVER ISLAND NATURAL GAS PIPELINE--B.C. HYDRO

Further to my memorandum of November 9 concerning the above mentioned project, I would like to submit the following concerns relating to the assessment of the agricultural capability:

- Information on terrain and agriculture are based on information from reconnaissance soil surveys of the Terrestrial Studies Branch, Ministry of Environment. I would like to point out that recent (preliminary), more detailed information on soils and agricultural capability exists and is available from Nanaimo to Shawnigan Lake. Also, additional physical and chemical soil data will soon be available.

- Section 7.5--Agriculture

  The statement at the end of the second paragraph implies that available water resources are frequently committed to non agricultural uses, thus limiting any potential for agricultural expansion. It should be noted that the total ground water potential is not fully explored and, secondly, that significant water storage potential exists. By storing the winter runoff in sufficient quantity, most if not all the moisture deficits occuring on agricultural lands could be alleviated.

- Agriculture Capability

  The statement on organic soils implies that all are of low capability. Organic soils (except for fibrisols) are some of the most productive soils in the region when they are improved by controlling the water table. They are often rated as Class 2.

. . . 2

- Section 11--Route Analysis

In general, the potential impact to agricultural lands have been reasonably well expressed along the corridor route. Potential terrain hazards have also been noted. What is missing and required is a clear statement on how these impacts will be minimized. For example, many terrain/soil units are composed of shallow stonefree deposits overlying coarse textured, very gravelly to stony deposits. To minimize impact to the farmer, a proper sequence of backfilling must be assured.

I would appreciate having these comments attached to those submitted previously. If you require further information, please contact Mr. Harvey Sasaki (387-5121).

J.E. Anderson
Director
Farmland Resources Branch

cc: W.E.A. Wickens
Dr. M.F. Clarke

HWS: sds

Province of British Columbia

MEMORANDUM

Mr. Bryan Gates
Co-ordinator
Guidelines for Linear Development
Assessment Branch
Ministry of Environment

December 17, 1981

VANCOUVER ISLAND NATURAL GAS PIPELINE--B.C. HYDRO

Further to our memorandums of November 9 and 19 and receipt of a copy from Joe Truscott of the Provincial Agricultural Land Commission's comments, we would like to take this opportunity to clarify some discrepancies.

1. Mainland Route. The Ministry of Agriculture and Food prefers the northern route option (Powell River) over the southern route option (Delta). The southern option, and its impacts, is not acceptable to this Ministry. The Provincial Agricultural Land Commission's preferred route option (Tilbury Island-Canoe Pass) is only reflective of the options presented them, i.e. of the two preferred route options nominated by B.C. Hydro, the Commission selected the Tilbury Island - Canoe Pass option, while the Ministry chose to not acknowledge the nominated route and indicated its preference was one of the routes not nominated.

2. Vancouver Island Route. The Ministry is in agreement with the routes preferred by the Commission.

If you require clarification of the above, please contact Mr. Harvey Sasaki (387-5121).

J.D. Anderson
Director
Farmland Resources Branch

cc: W.E.A. Wickens
Regional Director
South Coastal Regional District

Dr. M.F. Clarke, Chairman
Provincial Agricultural Land Commission

HWS: sds

Province of British Columbia

MEMORANDUM

To:

Mr. B.R. Gates
Senior Co-ordinator - Resources
E.L.U.C.
Buildings

Date:

October 26, 1981

Re: Vancouver Island Gas Pipeline - B.C. Hydro

Subsequent to our discussion on October 26, 1981, regarding the above, it became clear to me that you should have received a copy of the attached correspondence, which is self-explanatory and will suffice to meet your request for the comments of the Heritage Conservation Branch.

Harry L. Diener
Head
Impact Assessment and
Protection Section

HLD/ds
bcgeu
encl.

British Columbia
and Government Services
Victoria
British Columbia
V8V 1X4

September 30, 1981

Mr. R.A. Kawalilak
Project Communications Supervisor
Vancouver Island Gas Project
B.C. Hydro Gas Group
4940 Canada Way
Burnaby, B.C.
V5G 4K6

Dear Mr. Kawalilak:

Thank you for your letter of September 9, 1981 concerning the Vancouver Island Gas project. I should point out that the undersigned is the correct contact for the Heritage Conservation Branch regarding any matter directed toward heritage conservation in this project.

In response to your request for comments, please be advised that we agree with the recommendations made in the report "Vancouver Island Natural Gas Pipeline Heritage Resource Assessment and Corridor Selection Final Report, Permit No. 1980-1" as prepared by Brian C. Apland, then of ARESCO Ltd., Calgary, Alberta. To reiterate, the report on pages 37, 38, and 39 makes a number of recommendations pertaining to the proposed route alignments in which the researcher recommended in every instance the route containing the lowest potential for heritage sites as being the preferable route. We are attaching herewith a copy of the summary of route recommendations to minimize impact to heritage sites as recommended by the researcher.

It should be noted that this office is also in agreement with the recommendations made by the consultant pertaining to further investigation in the area. We note that the consultant has recommended 1. "Evaluative site testing excavation programs should be conducted at localities of unavoidable conflicts. At present this may occur at DgRv 7, 8, 9, 25 and 26; DgRw 184 and 186; DeRv 30 and 13; and DdRv 8."

2. "Those areas judged to have a medium to high resource potential should receive intensive 100% ground inspection, including subsurface testing."

3. "The remainder of the chosen alignment should receive some ground inspection but not necessarily to the level as those of medium to high potential. Here a sampling program could be implemented. It is suggested that a 10% sample survey would be sufficient in low priority areas."

It is therefore the position of the Heritage Conservation Branch that should this project proceed, British Columbia Hydro and Power Authority, in order to meet the concerns regarding heritage resources potentially affected by the project, follow the recommendations made in the report. Furthermore, it is suggested that the authority employ the Stage II and III Guidelines (attached hereto) in conducting the investigations that will be

....2

needed on the final route chosen.

In the event that your Corporation proceeds with the study, the Heritage Conservation would be most pleased to assist you in meeting the needs of the Branch in this particular project. Should you need additional information, please contact the undersigned.

Yours truly,

Harry L. Diener
Head
Impact Assessment and
Protection Section

HLD/ds
bcgeu
encl.

The sensitive areas are the west coast of Valdes Island where conflicts with known heritage sites may be difficult to avoid; the crossing of Cedar District near Nanaimo (8-11 and/or 8-100); and the Cowichan Valley to Shawnigan Lake (109-114) where conflicts with known heritage sites are apparent (DeRv-30, DeRv-13, DdRv-8). Heritage sites at the latter two areas should be possible to avoid.

The culture history of the Gulf of Georgia region extends to at least 5,500 B.C. and may extend as far back as 9,000 B.C. This suggests a 10,000 to 11,000 year time span for human activity in the region. Historic sites are not expected to be older than 130 to 150 years in age and will likely relate to early coal mining and logging activities. Such sites are not expected to be common since in most cases they will have been previously disturbed.

5.2 SUMMARY OF RECOMMENDATIONS

A review of the recommendations concerning proposed route alignments is offered below (Table 1). It must be noted that in all cases the route containing the lowest potential for heritage sites is chosen as preferable. With the exception of Valdes Island, the preferred route can be designed to avoid conflicts with known heritage resources and would likely be able to avoid those which may come to light during actual field survey.

TABLE 1

SUMMARY OF ROUTE RECOMMENDATIONS

TO MINIMIZE IMPACT TO HERITAGE SITES

SEGMENT	RECOMMENDATIONS
Delta	1-2 Alternate, 3-4 Prime
Valdes Island	5-7 Prime
Ladysmith	8-9 Prime, 9-10 Prime 10- Prime, 100-12 Alternate 100-101 Prime, 101-102 Alternate
Mt. Richards	102-105 Alternate, 105-110 Alternate
Duncan	110-112 Alternate
Shawnigan Lake	112-118 Alternate Note: Should Prime route be chosen 113-114 Prime 116-117 Alternate (west)
Esquimalt	118-119 Prime
Nanaimo	12-204 Prime Note: 11-201 should be avoided
Nanoose Bay	204-205 Prime 205-206 Prime (east)
Qualicum Beach	Prime
Port Alberni	210-303 Alternate 207-209 Alternate 209-210 Alternate 210-212 Alternate
Fanny Bay	213-215 Alternate 215-216 Prime
Courtenay	216-217 Alternate 217-220 Prime
Tsolum River	220-222 Alternate
Campbell River	222-224 Alternate 224-226 Alternate

5.3 RECOMMENDATIONS FOR FURTHER STUDY

In order to minimize potential impacts to heritage resources as a result of the proposed Vancouver Island Gas Pipeline, the following procedures are recommended:

- Evaluative site testing excavation programs should be conducted at localities of unavoidable conflicts. At present this may occur at DgRv-7, 8, 9, 25 and 26; DgRw-184 and 186; DeRv-30 and 13; and DdRv-8.

- Those areas judged to have a medium to high resource potential should receive intensive 100% ground inspection including sub-surface testing.

- The remainder of the chosen alignment should receive some ground inspection but not necessarily to the level as those of medium to high potential. Here a sampling program could be implemented. It is suggested that about a 10% sample survey would be sufficient in low priority areas.

TABLE 1

SUMMARY OF ROUTE RECOMMENDATIONS

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BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

RESOURCE INFORMATION CENTER
Heritage Conservation Branch
SEP 18 1981
Ministry of Provincial Secretary
and Government Services

Vancouver Island Gas Project
B. C. Hydro Gas Group
4940 Canada Way
Burnaby, B. C.
V5G 4K6
294-4971 (Local 56)

File: P1.450.6.1

9 September 1981

Ms. Ann Morgan
Resource Information Centre
Heritage Conservation Branch
1016 Langley
Victoria, B. C.
V8V 1X4

Dear Ms. Morgan:

Last March, B. C. Hydro published a "Corridor and Route Nomination Report" for a pipeline system to provide natural gas service to Vancouver Island.

You were sent a copy of the report or its Summary.

Substative comments and reactions to the report are now being analyzed so that they may be used to work out the best possible route for the pipeline.

If you wish to forward your comments on the report, we would appreciate receiving them before September 30, 1981 so we can ensure that they will be fully considered.

Should you need additional information, please contact me.

Yours truly,

R. A. Kawalilak
Project Communications Supervisor

British Columbia

Transportation,
~~Communications~~
and Highways
TRANSPORTATION

Suite 245
4299 Canada Way
Burnaby
British Columbia
V5G 1H3
Phone: 437-8591

File: PL 3.9(a)-1

November 27, 1981

Mr. Bryan Gates,
Co-ordinator, Guidelines for
Linear Development,
Ministry of Environment,
Assessment and Planning Division,
Parliament Buildings,
Victoria, B.C.
V8V 1X4

Dear Sir:

Re: "Corridor and Route Nomination Report"
Vancouver Island Gas Pipeline - B. C.
Hydro and Power Authority

We have reviewed the above noted Report and Atlas Volume and have the following comments:

1) Map 4A in the Atlas Volume shows the pipeline route parallel to the Roberts Bank Railway for a length of about one Kilometre. If the pipeline is close to the railway and not adequately protected, it is possible that a train derailment could damage the pipeline as has happened in the past. We require that the pipeline be installed far enough away from the railway so that there is no risk of such damage.

2) We note that the pipelines for the Georgia Strait and Stuart Channel portions are not to be buried. Will the negative buoyancy of the pipelines be sufficient to compensate for any underwater currents which might attempt to give transverse movement to the pipelines?

3) How will the two undersea portions of the pipelines be inspected and maintained?

4) Security of the supply of natural gas to Vancouver Island will depend upon the time required to repair the pipeline in case of failure. We would be interested to know what equipment is to be used, will it be purchased or contracted and what procedures are planned to carry out repairs in case of failure of the underwater portion of the Pipeline as well as the estimated time to repair.

.../2

5) What equipment will be used to inspect the undersea portions of the pipelines after installation on the undersea surface and prior to testing?

6) We note that it is proposed that in Nanaimo all distribution pipes 6" diameter and less be made of plastic to reduce capital costs. At what pressure will these pipelines operate?

In accordance with the Report, B.C. Hydro and Power Authority will be following C.S.A. Standard Z184-M1979 and their own standards when carrying out this project. Our task will be to ensure that the standards are followed along with the Pipeline Act and the Pipeline Regulations (Part XXX).

Yours truly,

F. H. Christensen, P. Eng.,
Chief Inspecting Engineer.

/mr

THE CORPORATION OF DELTA

R E P O R T

TO: MUNICIPAL ADMINISTRATOR FILE: 6-15-1

FROM: ENVIRONMENTAL CONTROL OFFICE DATE: JULY 31ST, 1981

SUBJECT: B.C. HYDRO/VANCOUVER ISLAND GAS TRANSMISSION LINE: ROUTE SELECTION THROUGH DELTA.

RECOMMENDATIONS:

That the Mayor and Council review and support the staff proposed gasline route through Delta as shown on the attached sketch (Appendix "A") and;

That B.C. Hydro be advised of and acknowledge Delta's requirements (Appendix "B") for use of the aforementioned route alignment and;

Further that the documentation appearing in Appendixes "A" and "B" form the basis of The Corporation of Delta's submission at the B.C. Hydro Public Meeting scheduled for August 6th, 1981 in Ladner.

ADMINISTRATOR'S COMMENTS:

UNFORTUNATELY COUNCIL HAS NOT HAD THE OPPORTUNITY TO MEET TO CONSIDER THIS REPORT; HOWEVER, THE POSITION IS BASED ON THE THREE PRINCIPLES WHICH WERE STATED BY THE MUNICIPAL COUNCIL. THEY ARE:-

1) WHERE POSSIBLE, USE EXISTING RIGHTS-OF-WAY.
2) WHERE POSSIBLE, KEEP OUT OF FARMLAND.
3) WHERE POSSIBLE, STAY CLEAR OF EXISTING MUNICIPAL SERVICES.

THE D/DIRECTOR OF ENGINEERING SERVICES WILL ATTEND THE PUBLIC MEETING THIS EVENING AND WILL PLACE THIS MUNICIPALITY'S POSITION BEFORE THOSE ASSEMBLED.

BACKGROUND:

The Gas Division of the B.C. Hydro & Power Authority have proposed to construct a gas transmission line to serve Vancouver Island, as part of this process the proponent is required, under Provincial Statute, to conduct the planning of the project in accordance with the Environment and Land Use Committees (E.L.U.C.) "Guidelines for Linear Development". One of the requirements under the E.L.U.C. guidelines calls for public participation through the use of a formal public meeting process in those areas which may be affected by the project. A public meeting for the Delta area has now been scheduled for August 6th, 1981, in Ladner.

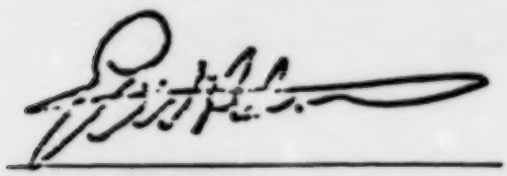
The purpose of this report is to provide, from a staff level, information to Council on what is perceived to be the most tolerable pipeline alignment (Appendix "A") through the Municipality.

...continued...

AUG 10 1981.
FOR PUBLIC WORK ONLY

In doing so, the main criteria used showed a preference to the existing rights-of-way, no new encroachment on farm lands, avoidance of residentially zoned areas and where possible, by-pass Municipal services. While these objectives are not fully satisfied by the proposed alignment, it (the alignment) in conjunction with those design construction and operating requirements sited in Appendix "B" would appear to minimize any adverse impacts on this Community.

Respectfully submitted,



E.C.W. Adams
Environmental Control Officer

ECWA:bls

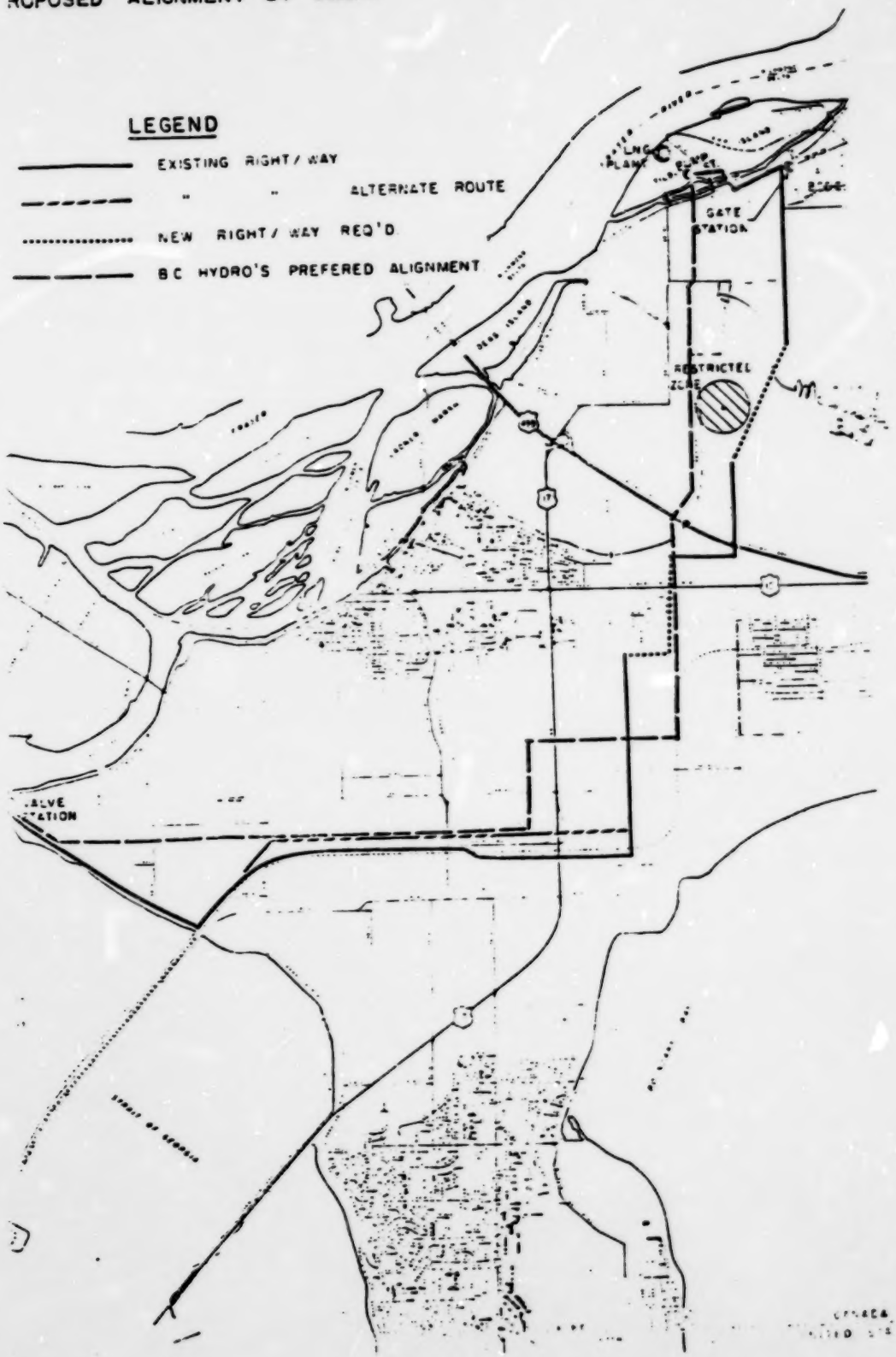
Attachments

cc: Director of Engineering Services
Director of Planning Services

* * * * * * * * * * * * * * * * *

APPENDIX A

ROPOSED ALIGNMENT BY DELTA



APPENDIX "B"

MUNICIPAL CONCERNS AND REQUIREMENTS FOR THE VANCOUVER ISLAND GAS TRANSMISSION LINE

In an attempt to minimize the potential impacts of routing the proposed Vancouver Island Gas Transmission Line through Delta, it is suggested that B.C. Hydro's Gas Division be instructed to comply with the following requirements. It is hoped that with B.C. Hydro's co-operation through the planning and design phase of this project any of the construction and operational phase impacts will be abated. The Corporation of Delta has therefore developed the following requirements to assist Hydro in meeting their project objectives and at the same time minimizing potential impacts on the local community.

I. PLANNING REQUIREMENTS:

1. The final design and alignment of the transmission line should take into consideration and be constructed in such a way as to permit the utilization of existing rights-of-way where physically possible (see appendix "A") or lands immediately adjacent existing rights-of-way.

2. B.C. Hydro shall advise the Planning Department of any restrictions on development that may be required in the proposed Holly Park Subdivision (ie. types of development, placement of schools and parks in relation to the pipeline, etc.).

3. All pipeline construction works within the B.C.D.C. Tilbury Industrial Park shall be co-ordinated with the Development Corporation and scheduled to minimize disruption of the activities of those users of the Industrial Park.

II. ENGINEERING REQUIREMENTS:

Delta must be allowed to review and comment on first draft design drawings and final construction drawings to ensure there is not a conflict between the proposed pipeline and existing or future Municipal services. This review must take place prior to materials being ordered for these works (ie. review must be prior to irreversible commitment by Hydro).

1. All works affecting drainage patterns or structures north of 60th Avenue and west of 80th Street must be co-ordinated with Delta and the Provincial Ministry of Environment under an A.R.D.S.A. Program.

...continued...

2. The pipeline alignment north of Trunk Road must follow Delta's preferred route as shown in Appendix "A". This will minimize impacts on major ditch works, avoid farm lands in Crescent Slough North, avoid a restricted area around the explosives bunker and allow utilization of existing rights-of-way for most of the northern part of the pipeline.

3. Delta's preferred alignment crosses Ladner Trunk Road just east of the Ladner urban development boundary at Anderson Place. This route by-passes the South Delta Annacis Trunk sewer forcemain and also does not interfere with proposed gravity sewage collection systems in the Holly Park Subdivision.

4. All above-service crossings of Municipal water and sewer lines by the transmission line shall result in those Municipal services being upgraded, by B.C. Hydro, to a non-maintenance condition in the area of that crossing.

5. Given that the transmission pipeline will be protected from electrolysis by a cathodic protection system, provision must be made, by Hydro, to ensure that this system does not interfere with Delta's cathodic protection systems. Assurance should also be given Delta that current loss from the transmission line protection system will not damage unprotected Municipal services.

6. All works involving the dyking system shall be done in co-ordination with and with the approval of The Corporation of Delta and the Provincial Inspector of Dykes.

III. GENERAL ENVIRONMENTAL:

1. All machinery, equipment and mechanical devices to be used at the gate station, pump station or valve station or along the route, other than construction equipment, shall be adequately soundproofed. Sounds from such sources shall not exceed sixty-five decibels measured on a "A" weighting network (65 dBA) at any time, measured at a point not closer than the boundary of the land on which the station is sited.

...continue...

2. All scheduled works in and around Tilbury Slough shall be done only after approval has been received from the B.C. Fish & Wildlife Branch, the Canadian Wildlife Service and the Department of Fisheries & Oc ans.

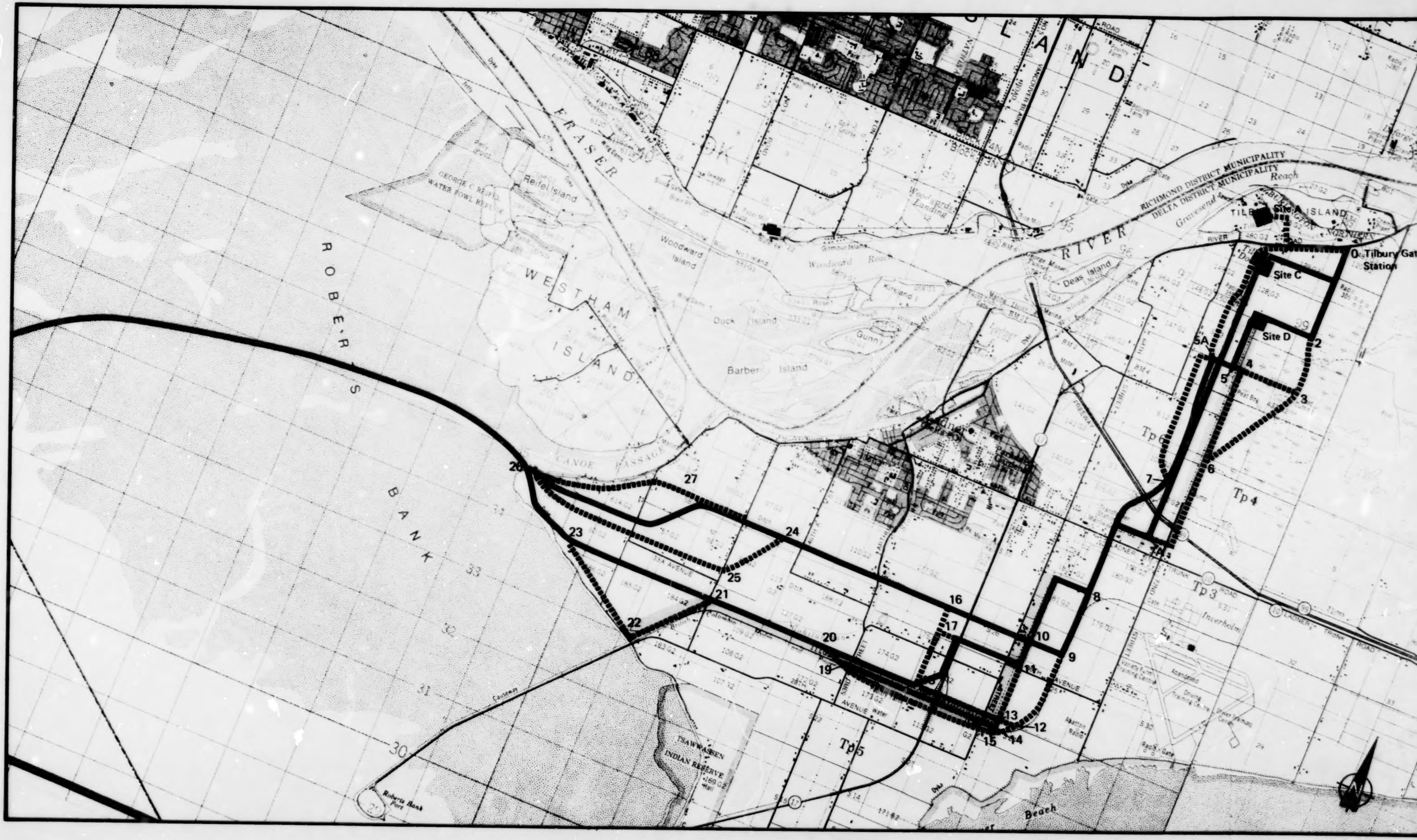
3. All works encroaching on agricultural lands shall be restricted, where possible, to those areas having existing rights-of way.

4. Ditching techniques shall be used which preserve the integrity of the soil stratification after backfilling (ie. topsoil on top).

5. Provision shall be made to ensure in-place field drainage is not disrupted, altered or destroyed.

6. All works outside the dyke on Roberts Bank shall conform with the conditions and requirements setforth by the Provincial Ministry of Environment Order in Council 908 Review Committee that has been established to monitor that phase of the project.

* * * * * * * * * * * * * * *


ROBERTS BANK
FRASER RIVER
WESTHAM ISLAND
Reifel Island
GEORGE C. REIFEL WATER FOWL REFUGE
Woodward Island
Duck Island
Barber Island
Gunn I.
Deas Island
Deas Island Slough
Woodward Landing
Gilmour Island
Kirkland I.
Canoe Passage
Canoe Pass
Tsawwassen Indian Reserve
Roberts Bank Port
Causeway
Beach
Tilbury Island
Tilbury Creek
Tilbury Reach
Tilbury Gas Station
Site A
Site C
Site D
Tp 6
Tp 5
Tp 4
Tp 3
RICHMOND DISTRICT MUNICIPALITY
DELTA DISTRICT MUNICIPALITY
ROAD
AVENUE
STREET
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Map 1

DELTA

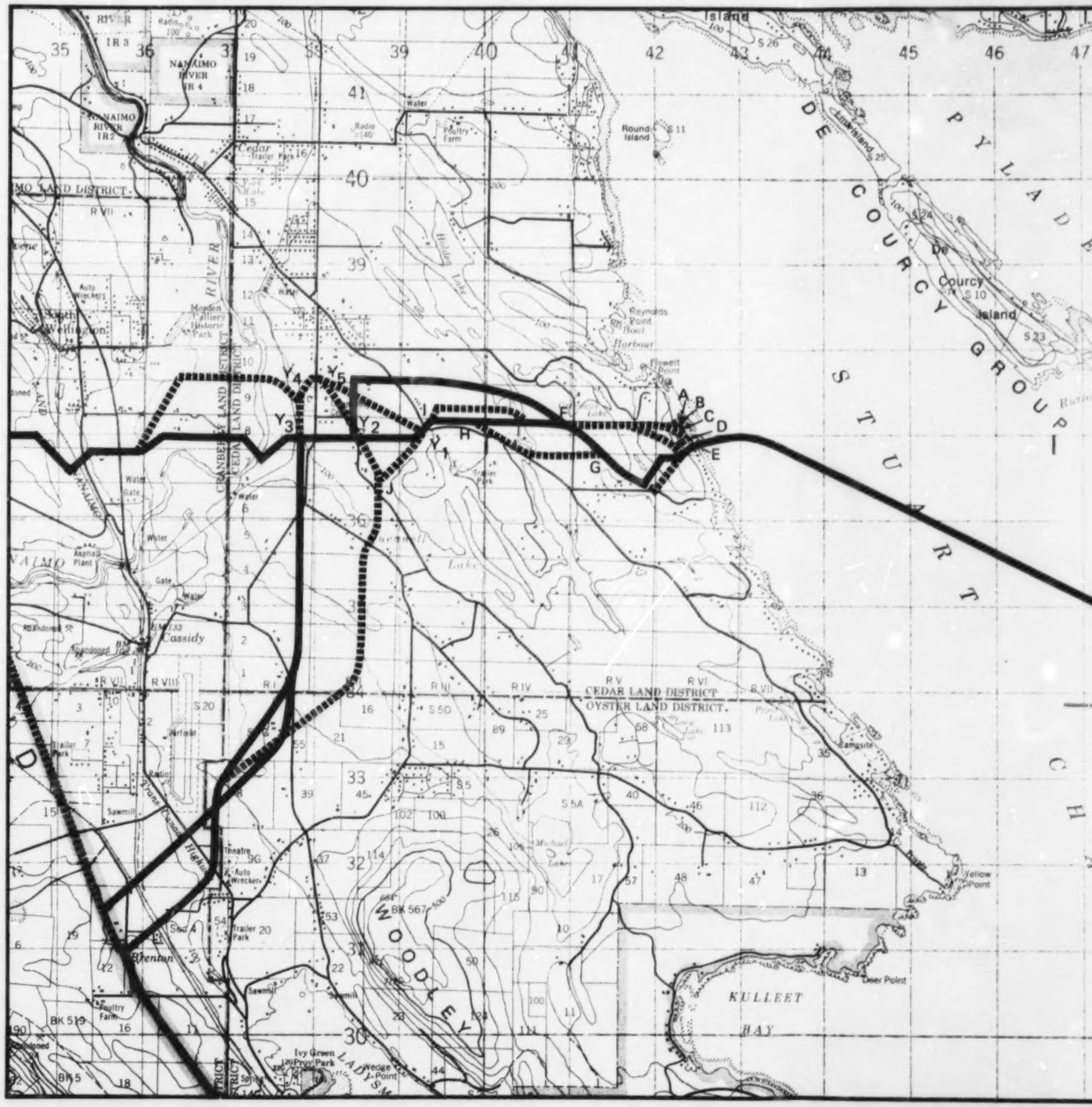
LEGEND

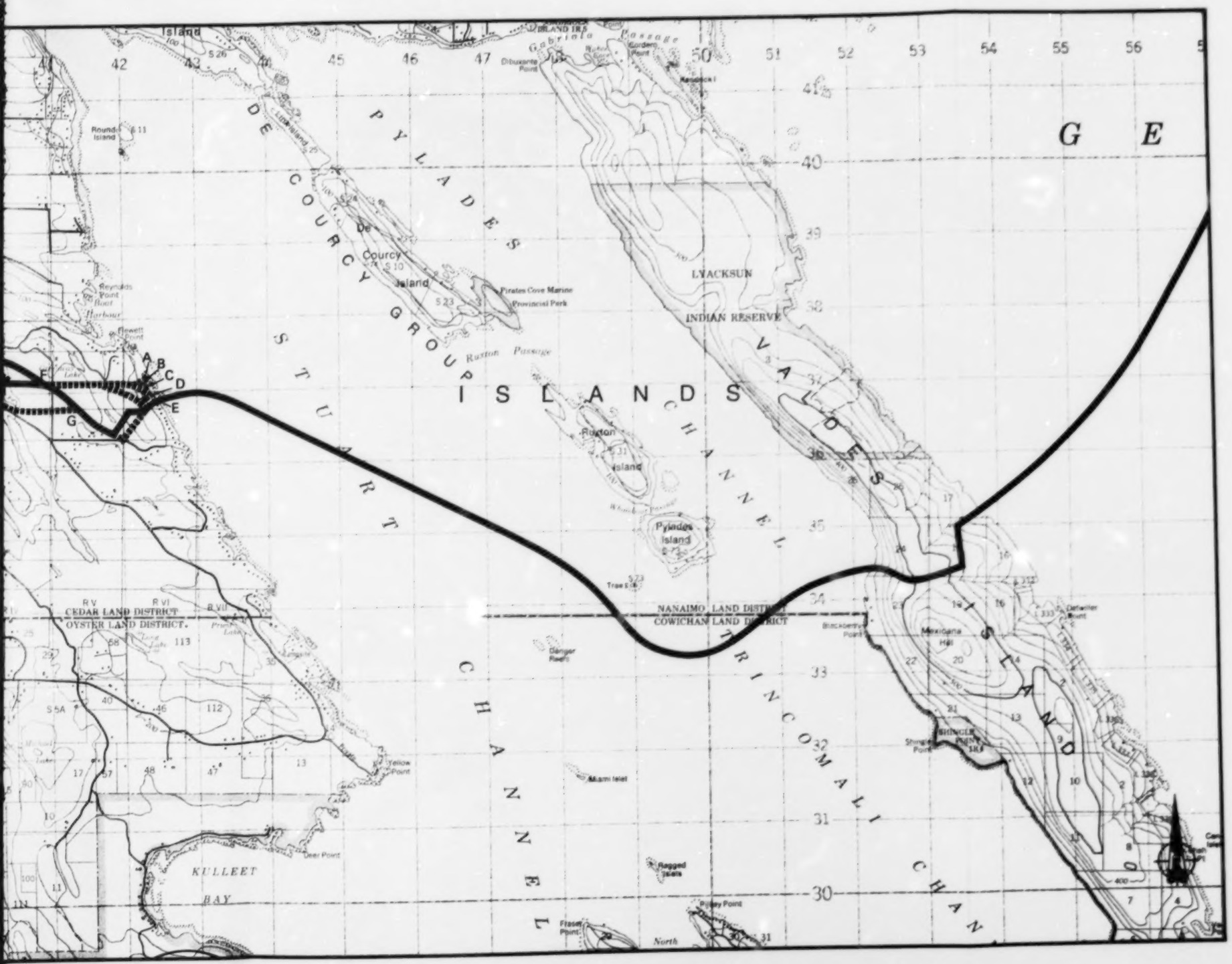
- Preferred Pipeline Route
- Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
- Nominated Pipeline Route where different from preferred route.
- Other Route Alternatives
- 4 or Y — Route Nodes
- Compressor Station Site
- Existing electrical transmission right of way adjacent to route.
- 45 — Kilometre Post

SCALE : 1:50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles





Map 2

VALDES ISLAND

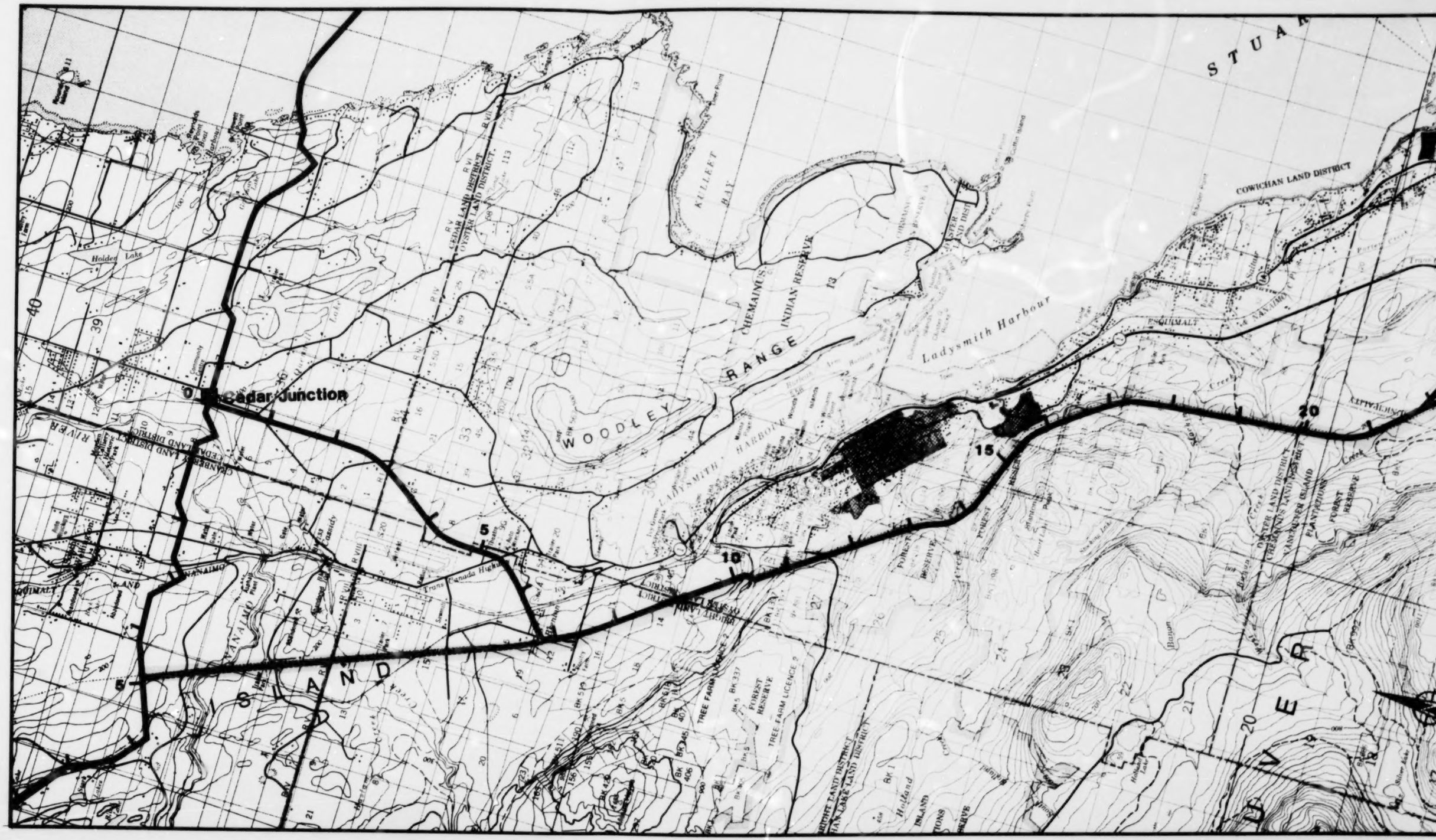
LEGEND

———	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
———	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles


Holden Lake
Cedar Junction
CEDAR LAND DISTRICT
OYSTER LAND DISTRICT
KILLEET BAY
CHEMAINUS INDIAN RESERVE 13
WOODLEY RANGE
Ladysmith Harbour
COWICHAN LAND DISTRICT
NANAIMO
ESQUIMALT & NANAIMO R.W.
Trans Canada Highway
TREE FARM LICENCE 2
FOREST RESERVE
Holland
ISLAND
RIVER
5
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20
40
39

Map 3

LADYSMITH

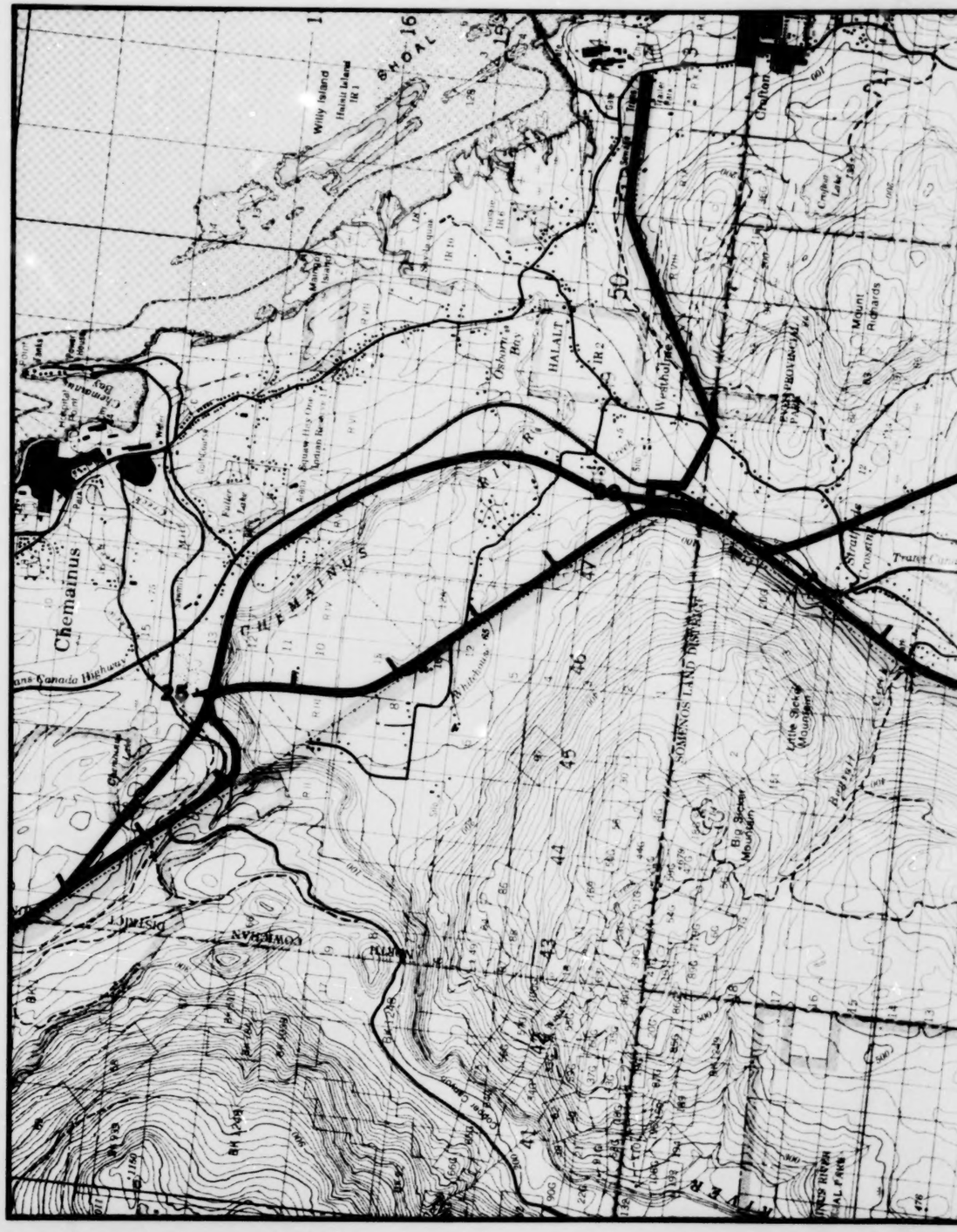
LEGEND

▬▬▬	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
▬▬▬	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles



Map 4

DUNCAN

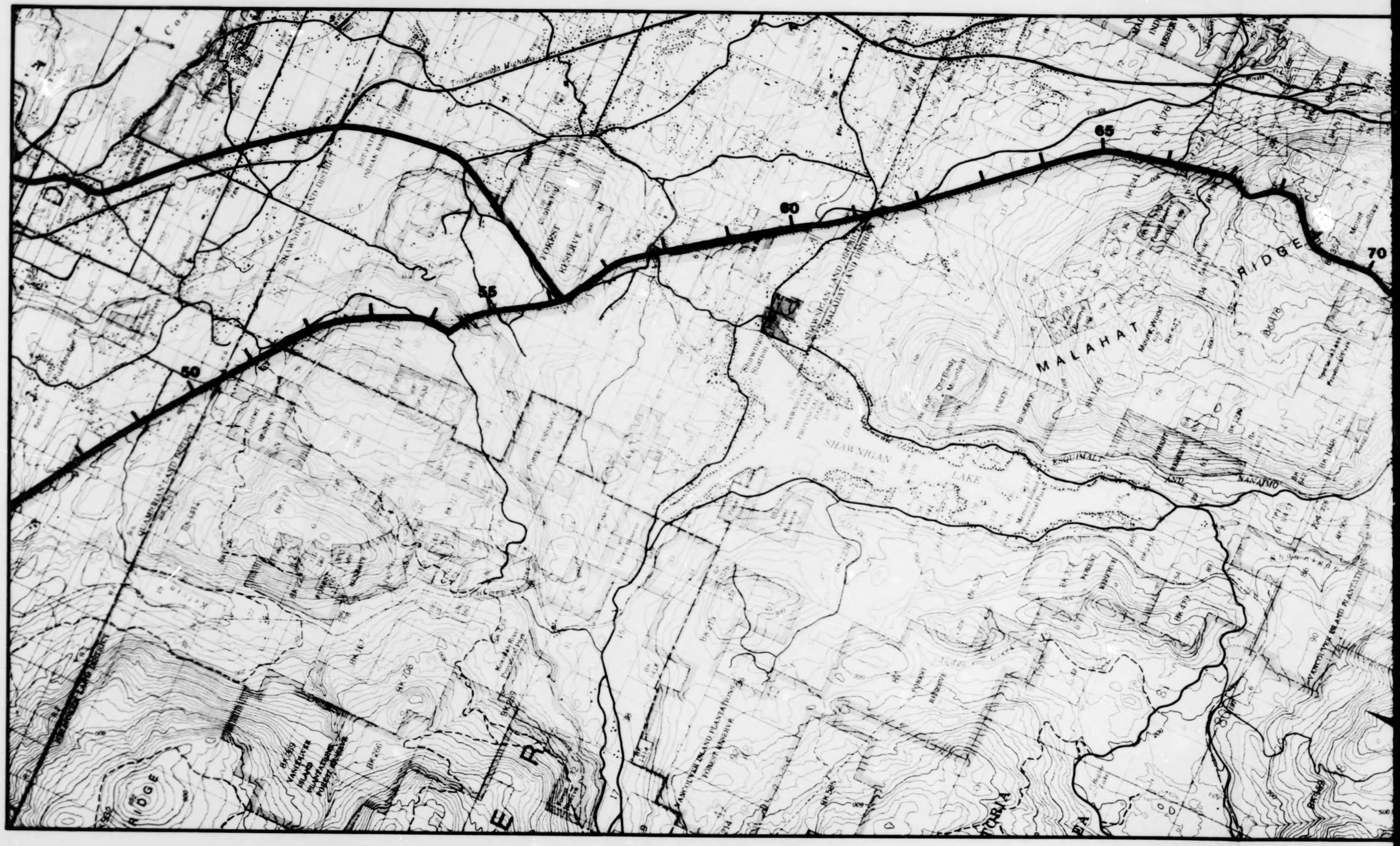
LEGEND

▬▬▬	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
▬▬▬	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles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MALAHAT
RIDGE
SHAWNIGAN
LAKE
MALAHAT
FOREST
RESERVE
SHAWNIGAN
LAND
DISTRICT
MILL BAY
INDIAN
RESERVE
ESQUIMALT
AND
NANAIMO
VANCOUVER
ISLAND
PLANTATIONS
FOREST
RESERVE
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RIDGE
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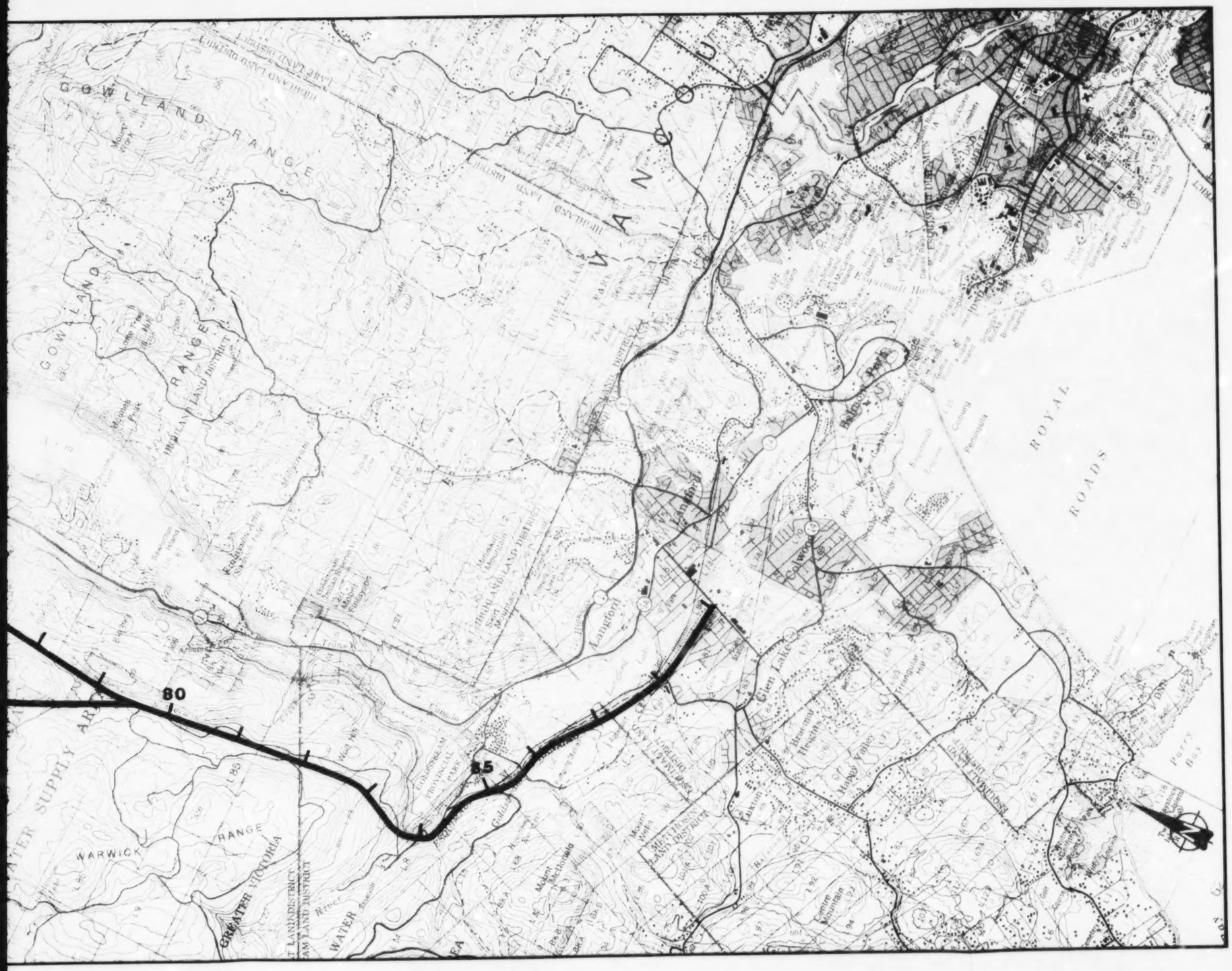
NANAIMO
Mount Jeffrey
Mount Hall
Mount Richards
Mount Brenton
Mount Benson
Mount Prevost
Mount Tuam
Mount Tzouhalem
Mount Sicker
Mount Prevost
Mount Maxwell
Mount Tuam
Mount Tzouhalem
Mount Sicker
Mount Richards
Mount Brenton
Mount Benson
Mount Hall
Mount Jeffrey
Mount Maxwell
Mount Prevost



Map 6

VICTORIA

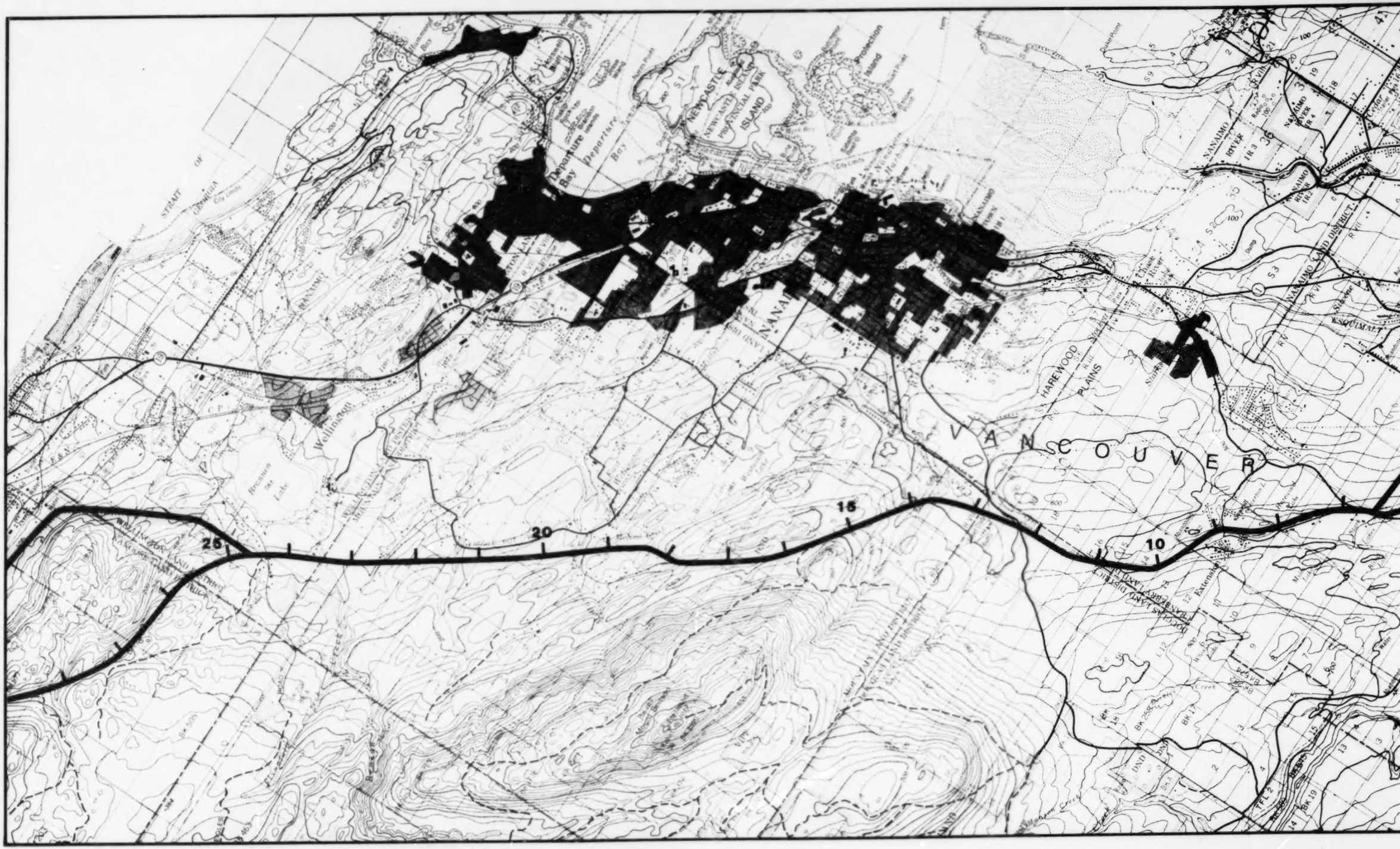
LEGEND

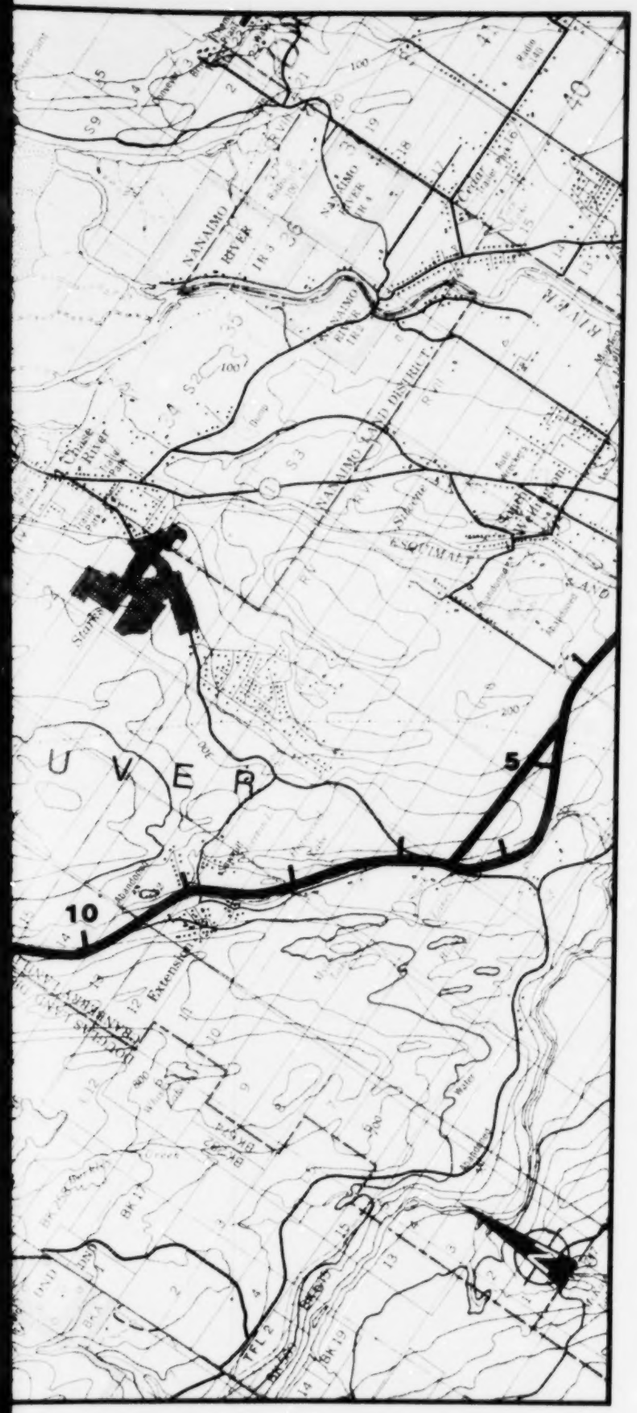
▬▬▬	Preferred Pipeline Route
▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
▬▬▬	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles


Departure Bay
NEWCASTLE ISLAND
NEWCASTLE PROVINCIAL PARK
Protection Island
STRAIT OF GEORGIA
NANAIMO RIVER
NANAIMO RIVER IR 4
NANAIMO RIVER IR 3
NANAIMO RIVER IR 2
NANAIMO LAND DISTRICT
Chase River
HAREWOOD PLAINS
VANCOUVER
25
20
15
10



Map 7

NANAIMO

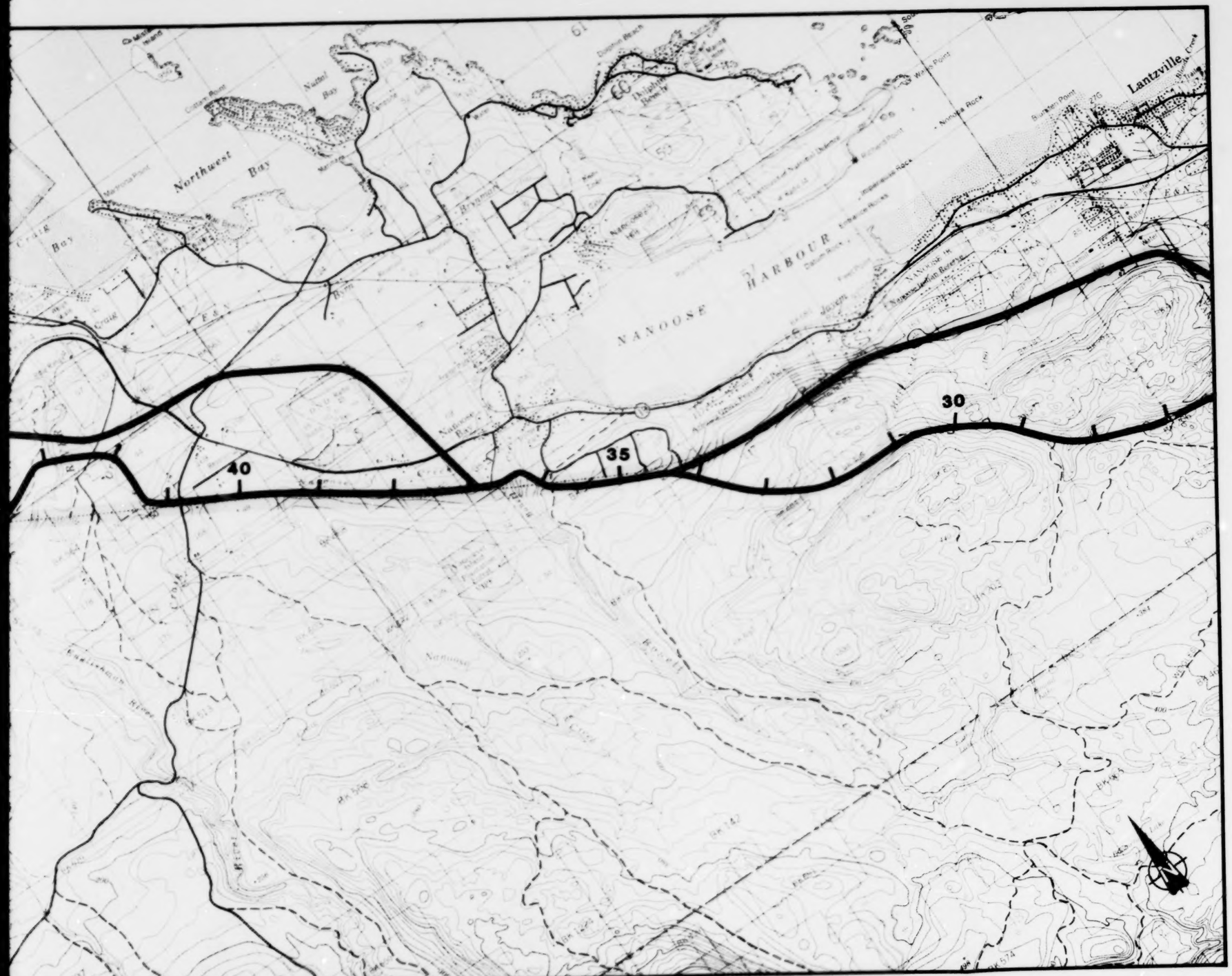
LEGEND

- Preferred Pipeline Route
- Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
- Nominated Pipeline Route where different from preferred route.
- Other Route Alternatives
- 4 or Y — Route Nodes
- Compressor Station Site
- Existing electrical transmission right of way adjacent to route.
- 45 — Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles



Map 8

NANOOSE BAY

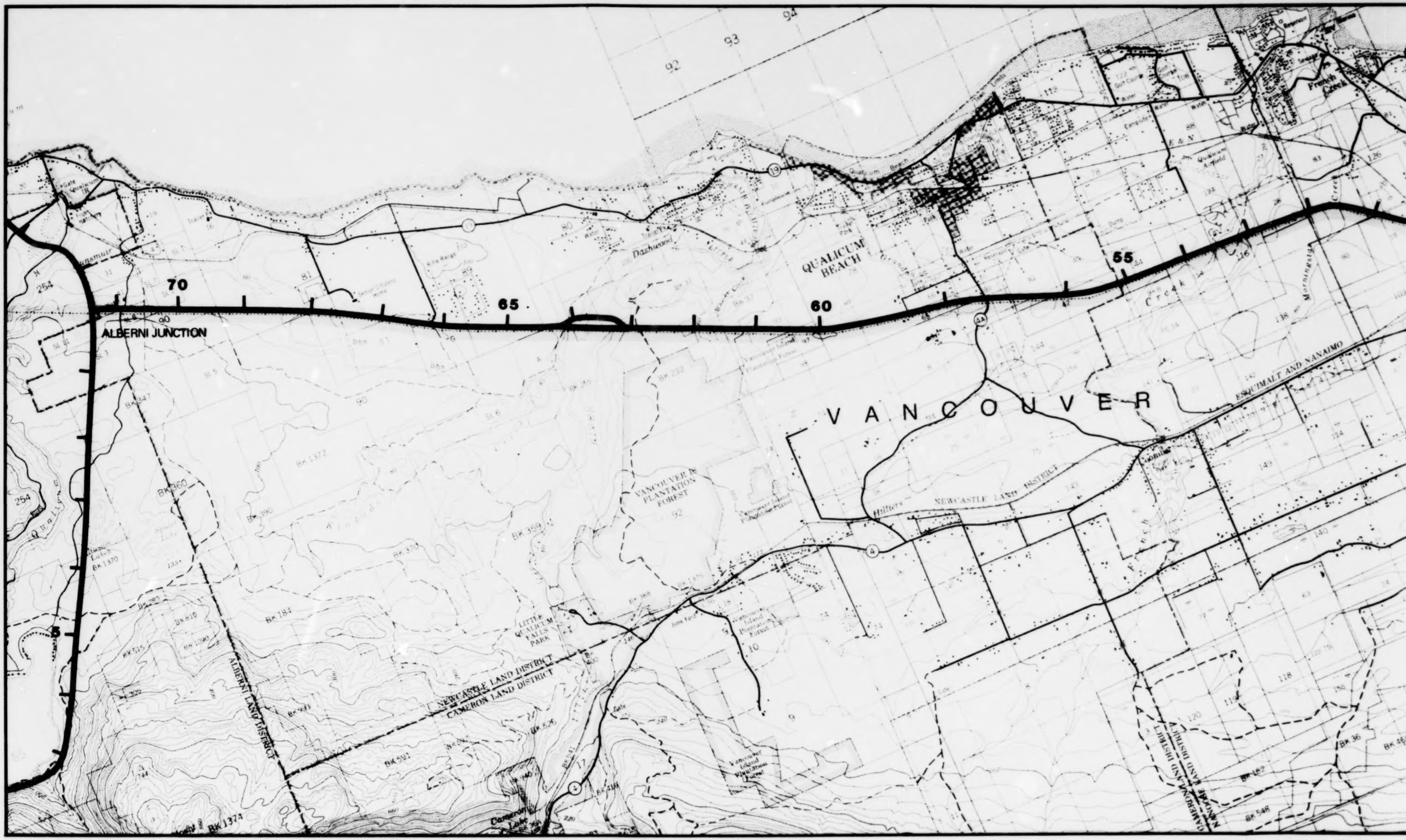
LEGEND

- Preferred Pipeline Route
- Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
- Nominated Pipeline Route where different from preferred route.
- Other Route Alternatives
- 4 or Y — Route Nodes
- Compressor Station Site
- Existing electrical transmission right of way adjacent to route.
- 45 — Kilometre Post

SCALE : 1: 50.000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles


70
65
60
55
ALBERNI JUNCTION
QUALICUM BEACH
VANCOUVER
ALBERNI LAND DISTRICT
NEWCASTLE LAND DISTRICT
CAMERON LAND DISTRICT
VANCOUVER ISLAND PLANTATION FOREST
QUALICUM BEACH PARK
LITTLE QUALICUM FALLS PARK
Dashwood
French Creek
Parksville
Qualicum Beach
Hilliers
Cameron Lake
Bk 1372
Bk 1374
Bk 360
Bk 184
Bk 501
Bk 548
Bk 36
92
93
94

Map 9

QUALICUM BEACH

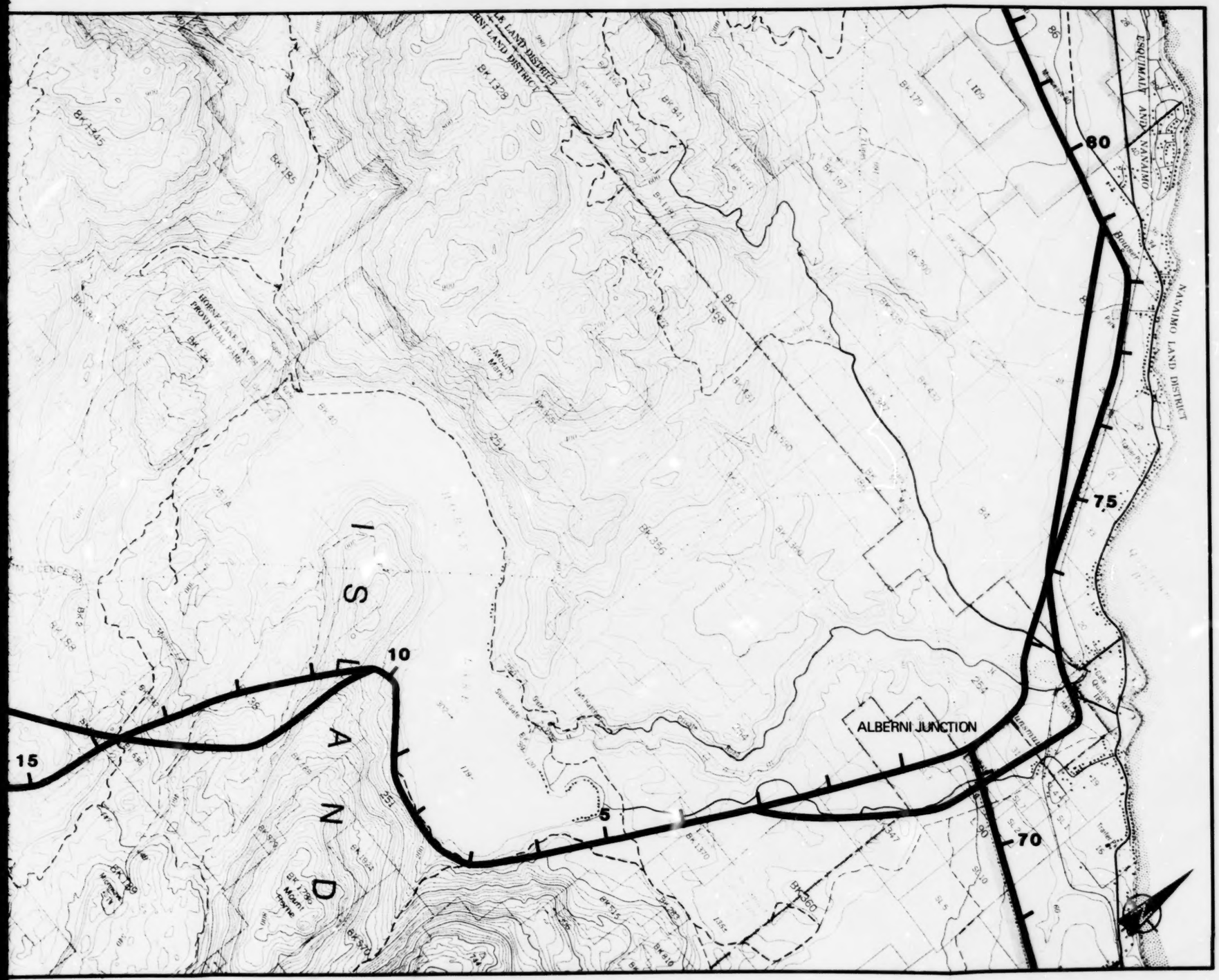
LEGEND

▬▬▬	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
▬▬▬	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles



Map 10

PORT ALBERNI

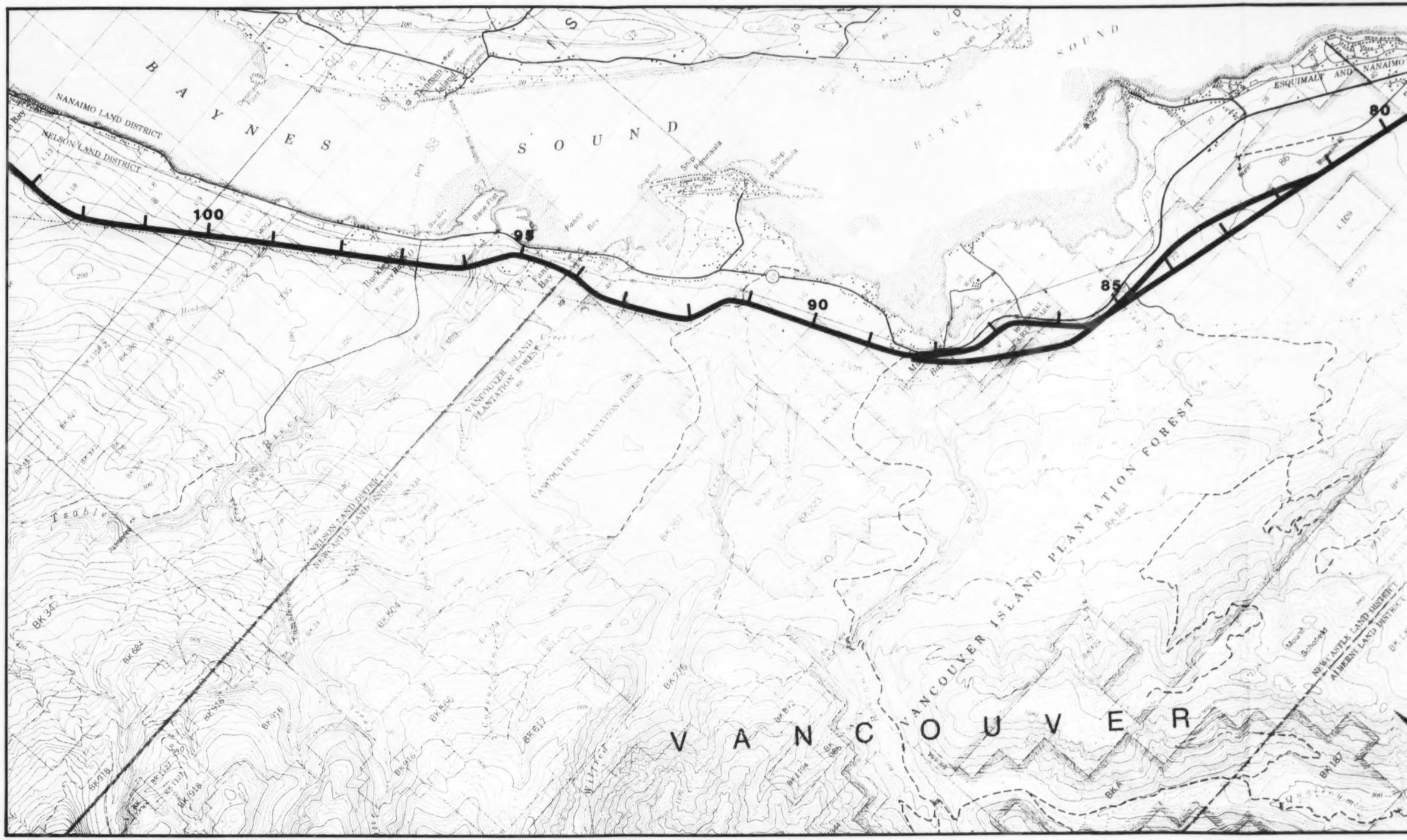
LEGEND

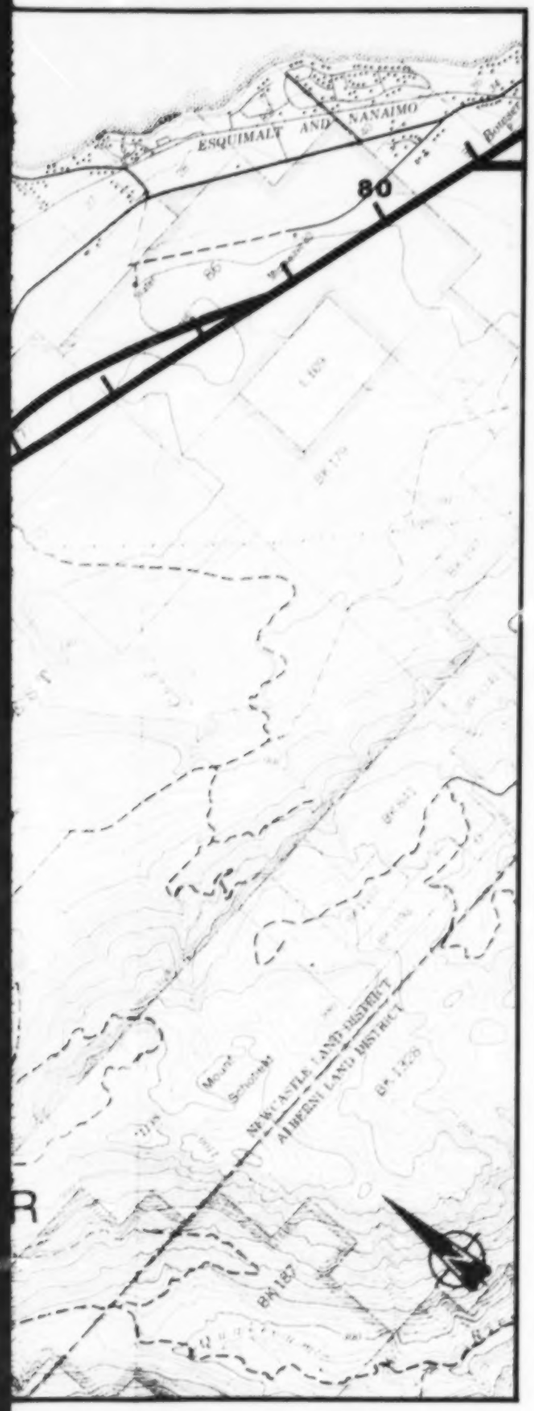
———	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
———	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1:50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles


BAYNES SOUND
NANAIMO LAND DISTRICT
NELSON LAND DISTRICT
100
95
90
85
80
Denman Island
Base Flat
Fanny Bay
Buckley Bay
Hodges
Tsable
VANCOUVER ISLAND PLANTATION FOREST
NELSON LAND DISTRICT
NEWCASTLE LAND DISTRICT
ESQUIMALT AND NANAIMO
NEWCASTLE LAND DISTRICT
ALBERNI LAND DISTRICT
VANCOUVER



Map 11

FANNY BAY

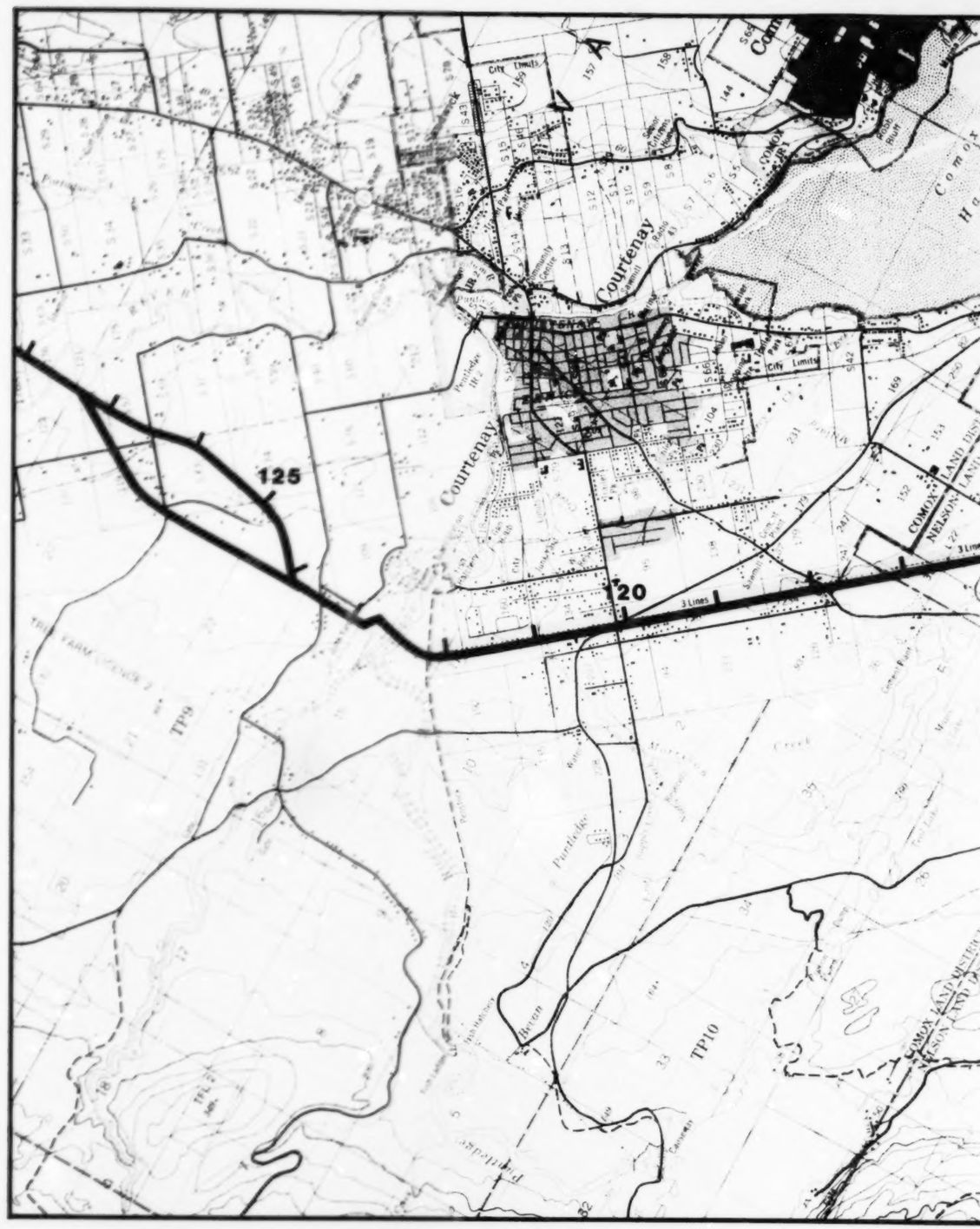
LEGEND

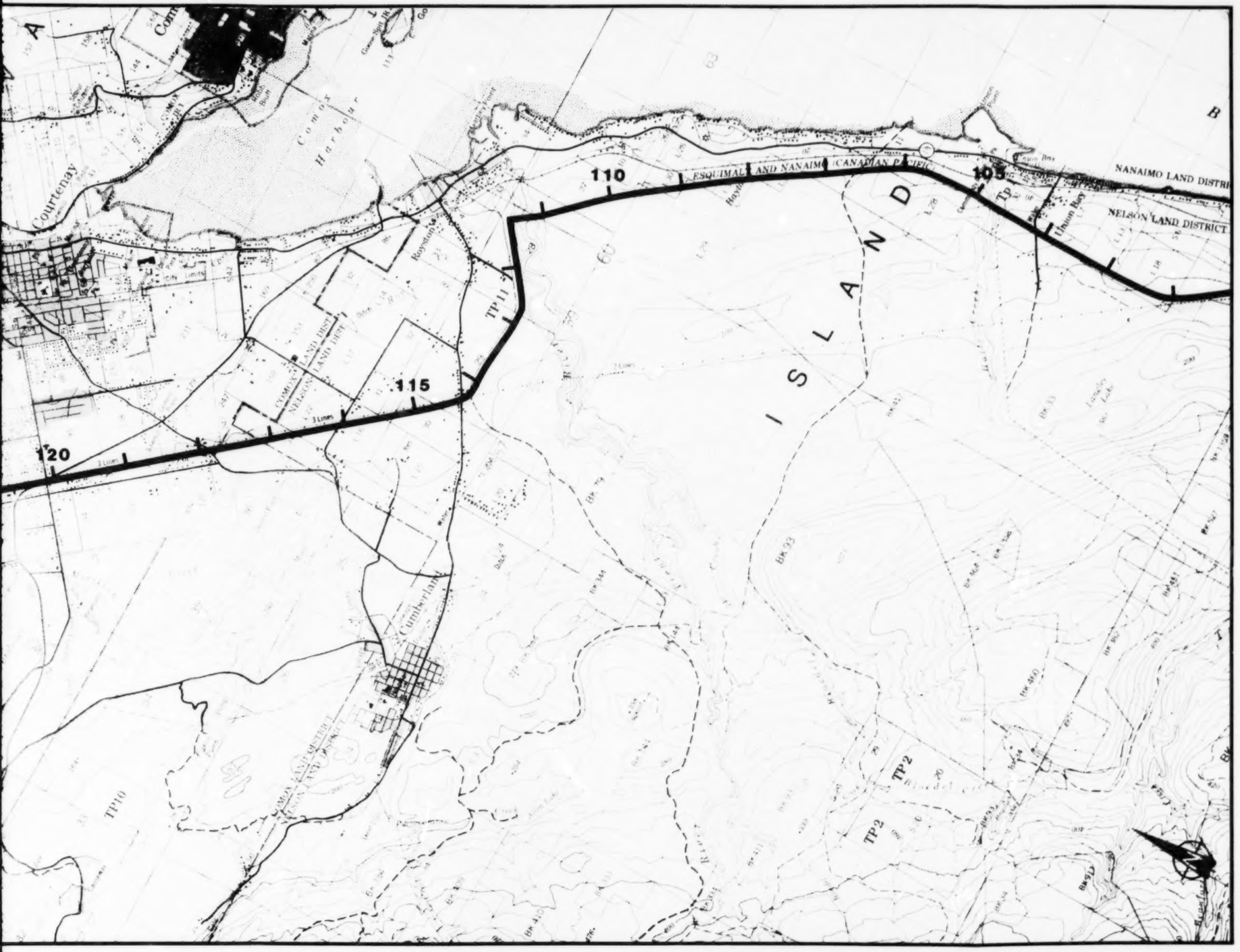
- Preferred Pipeline Route
- Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
- Nominated Pipeline Route where different from preferred route.
- Other Route Alternatives
- 4 or Y — Route Nodes
- Compressor Station Site
- Existing electrical transmission right of way adjacent to route.
- 45 — Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles





Map 12

COURTENAY

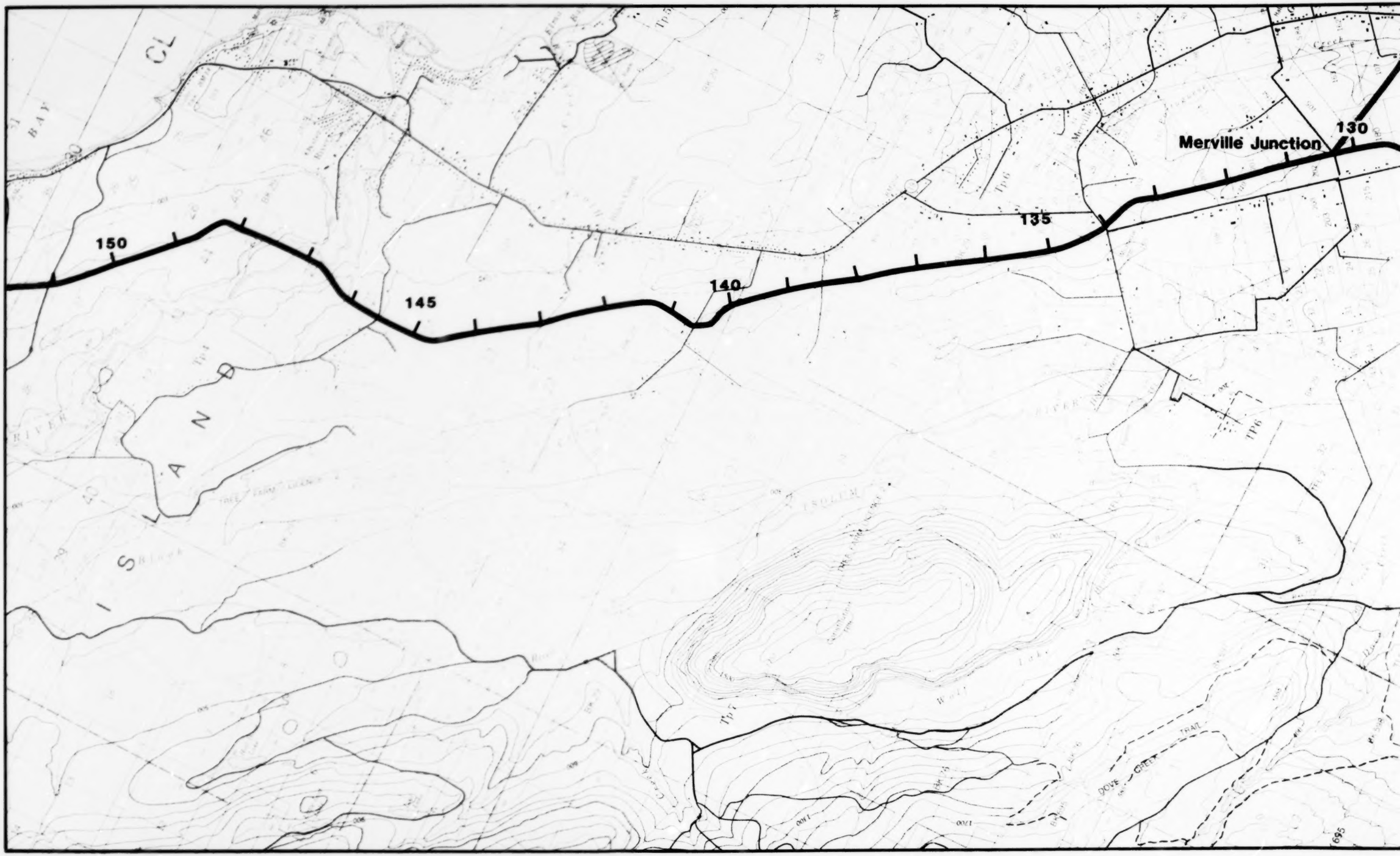
LEGEND

- Preferred Pipeline Route
- Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
- Nominated Pipeline Route where different from preferred route.
- Other Route Alternatives
- 4 or Y — Route Nodes
- Compressor Station Site
- Existing electrical transmission right of way adjacent to route.
- 45 — Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles


Merville Junction
130
135
140
145
150
BAY
RIVER
DOVE CREEK TRAIL
TP6
695

Map 13

TSOLUM RIVER

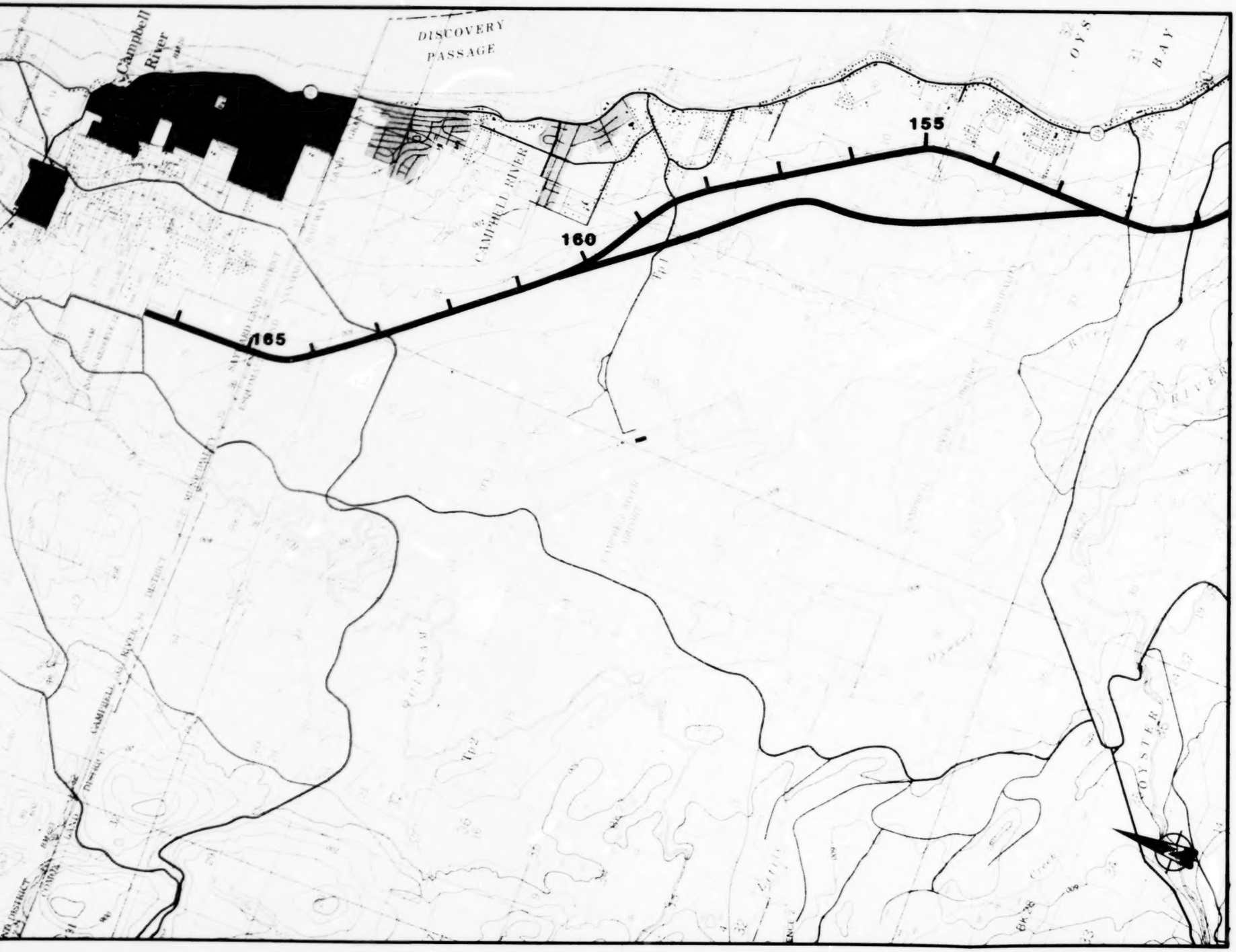
LEGEND

———	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
———	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles



Map 14

CAMPBELL RIVER

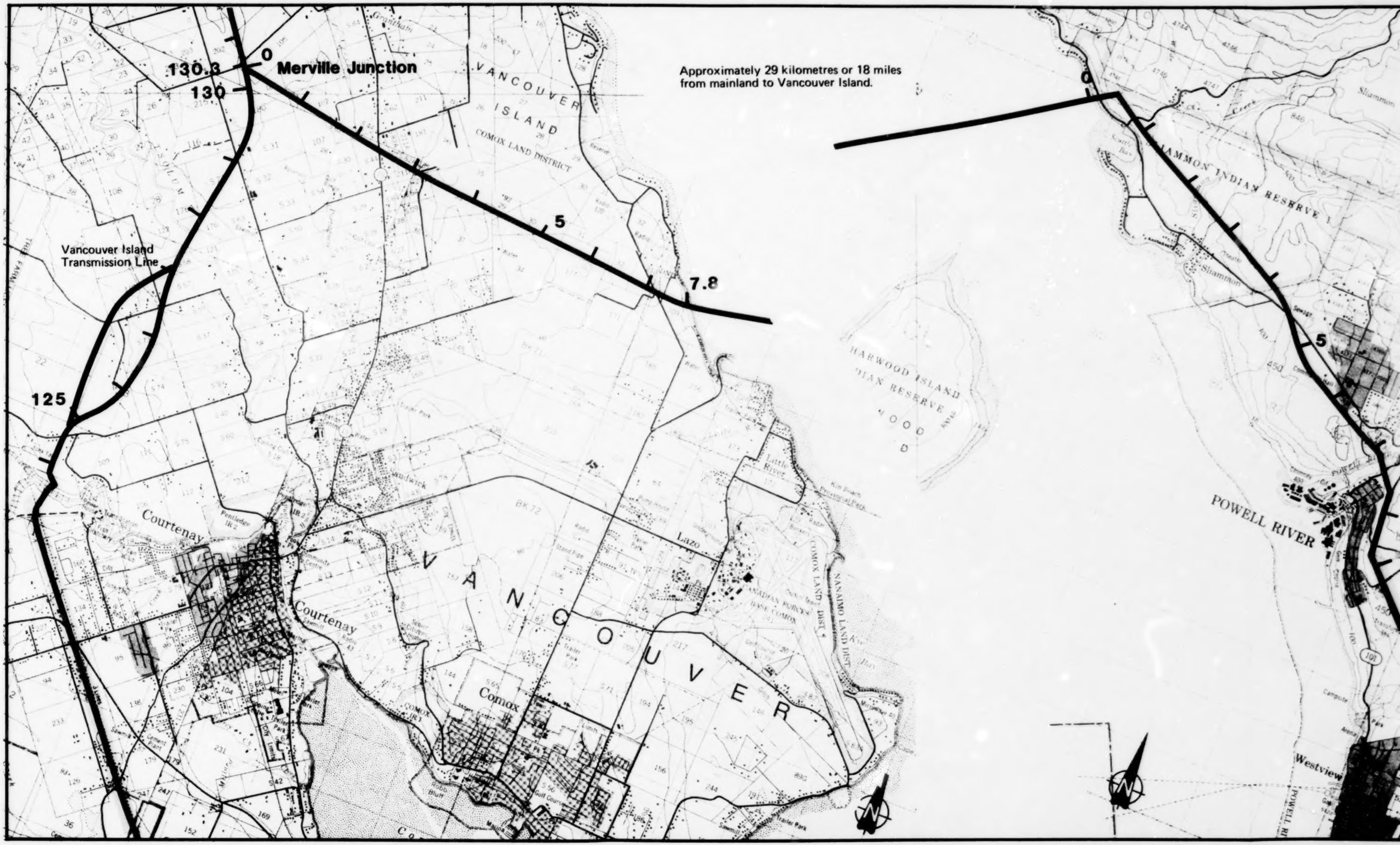
LEGEND

- Preferred Pipeline Route
- Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
- Nominated Pipeline Route where different from preferred route.
- Other Route Alternatives
- 4 or Y — Route Nodes
- Compressor Station Site
- Existing electrical transmission right of way adjacent to route.
- 45 — Kilometre Post

SCALE : 1: 50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles


130.3
130
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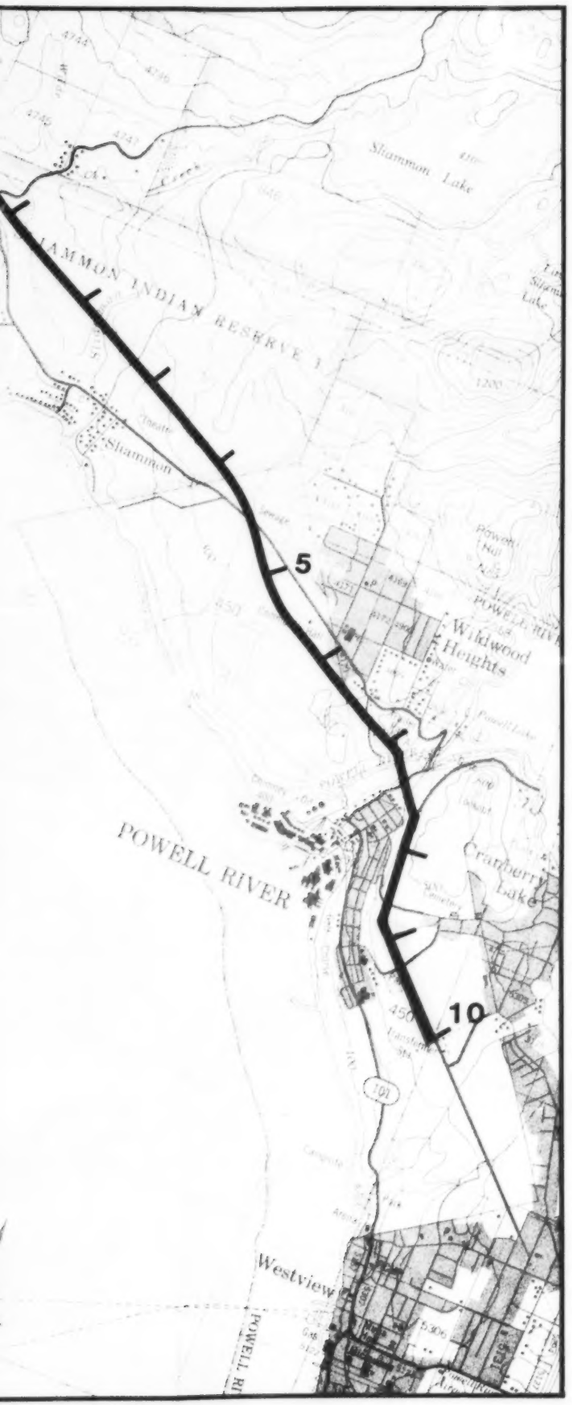
Merville Junction
5
7.8
Approximately 29 kilometres or 18 miles
from mainland to Vancouver Island.
Vancouver Island
Transmission Line
125
Courtenay
Courtenay
Comox
VANCOUVER ISLAND
COMOX LAND DISTRICT
VANCOUVER
Lazo
COMOX LAND DIST.
NANAIMO LAND DIST.
CANADIAN FORCES
BASE COMOX
HARWOOD ISLAND
INDIAN RESERVE
WOOD
SLIAMMON INDIAN RESERVE 1
Sliammon
POWELL RIVER
Westview
Little
River
Kin Beach
Provincial Park
Gulf Course
Trailer Park
Campsite
Cemetery
Park
Arena
Pentledge
IR 2
COMOX
IR 3
Robb
Bluff
Grantham
Woodwick
Creek
Sewage
Lagoon
Radio
Tower
Stand Pipe
Reservoir
Trailer
Park
Cemetery
Plant
Gravel
Pit
Limits
Golf
Course
Campsite
Arena
Park
Sewage
Lagoon
Creek
Reserve
Indian
Reserve
Cemetery
Plant
Gravel
Pit
Limits
Golf
Course
Trailer
Park



Map 15

POWELL RIVER LATERAL

LEGEND

———	Preferred Pipeline Route
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Preferred Alternate Pipeline Route (Tilbury Compressor Station Site)
———	Nominated Pipeline Route where different from preferred route.
▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪	Other Route Alternatives
4 or Y	Route Nodes
■	Compressor Station Site
	Existing electrical transmission right of way adjacent to route.
45	Kilometre Post

SCALE : 1:50,000

1 1/2 0 1 2 Kilometres

1 1/2 0 1 2 Miles

POOR

QUALITY

ORIGINAL